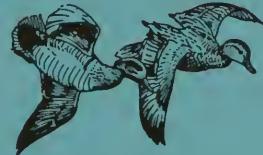


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THE GREEN-WINGED TEAL: ITS DISTRIBUTION, MIGRATION, AND POPULATION DYNAMICS



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THE GREEN-WINGED TEAL: ITS DISTRIBUTION, MIGRATION, AND POPULATION DYNAMICS

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INTRODUCTION

The green-winged teal is the smallest of our ducks. It is widely distributed, nesting from Alaska to Newfoundland and from the northern tree limit to central California and Maine, and wintering from British Columbia and Newfoundland south to Venezuela. The greenwing ranks second or third in the duck harvest of the Central and Mississippi Flyways, third or fourth in the Pacific Flyway, and fifth or sixth in the Atlantic Flyway (Waterfowl Status Reports, 1951-63). Since 1950, at least, it has constituted 10 percent of the annual continental harvest. As interest in waterfowl increases and the supply becomes less certain, the idea of regulating harvest by species has increased. It becomes increasingly important, therefore, to learn and describe the population characteristics of each of the game species. Because of the currently low population levels of important waterfowl species such as the mallard, black duck, canvasback and redhead, regulations governing the hunting of these choice species have been restrictive. Thus species like the green-winged teal become more important as sources of additional hunting opportunity, but despite its wide distribution and rank among the 20-odd species in the harvest, information is lacking about its status. The present work reports a study of the distribution, migration, hunting kill, survival, and status of the green-winged teal in the New World.

Acknowledgments

This report was the result of a major research effort by the senior author and is an abbreviated form of his doctoral dissertation. The junior authors provided assistance in obtaining data, in organization and editing of the report, and in minor parts of the analysis. This study was made possible through the generous assistance of officials of Laval University, Quebec, especially the Dean of Science, C. Geoffrion, and G. Filteau. We are greatly indebted to the staff of the Migratory Bird Populations Station, (Laurel, Maryland) and especially to W. F. Crissey and A. D. Geis who suggested this study. We are thankful to D. A. Munro who, with G. Filteau, was the senior author's research director. The senior author's wife, Therese, deserves thanks for the patience she showed during the study.

Finally, this study was the outcome of the cooperative venture of a large group of ornithologists who have banded green-winged teal for half a century -- their investment is large and we are grateful to them.

Previous Studies

Short descriptions of the life history and migration of the green-winged teal are found in works by Bent (1925), Hochbaum (1944), and Sowls (1955). The migration and life history of the green-winged teal

in British Columbia were described by Munro (1949); Low (1949) plotted the recoveries of green-winged teal banded until 1949 in Canada and the United States; Van den Akker and Wilson (1949) commented on the birds banded at Bear River Refuge, Utah; and Boyd (1957) reported the mortality and kill rates of the European green-winged teal in Britain. Some information on the ecology of the green-winged teal was given by Keith (1961), and on sex and age ratios by Bellrose et al. (1961), but the literature did not contain any information on the mortality rate, kill rate, and other aspects of the population dynamics of the green-winged teal in North America.

Objectives

The main objectives of this study were:

1. To define summer and winter population units and associated migration routes.
2. To determine harvest characteristics and survival of summer and winter populations in various areas throughout the range.
3. To determine timing and relative importance of the harvest in each State, flyway or other harvest area.
4. To determine the role of hunting and hunting regulations in the management of the species.
5. To make recommendations for management and point out research needs.

Sources of Data

The main source of data was the records of green-winged teal banded and recovered in North America filed at the Migratory Bird Populations Station, United States Bureau of Sport Fisheries and Wildlife, Laurel, Maryland. We analyzed only the records relating to wild birds that were trapped, banded, and released in a normal manner during all years up to and including 1961. Records for birds considered sick or treated in an experimental manner, such as those color-banded, transported, or raised in captivity, were eliminated. Only the recoveries of birds reported shot or found dead during the hunting season were used in most cases; all recoveries obtained in other ways, such as birds retrapped or shot out of season, were not used in studies of recovery rates and mortality rates. Recoveries from birds shot out of season in Canada and Mexico were examined when they were needed to clarify movements, etc.

Few banding operations have been organized for the specific purpose of banding green-winged teal. Many of the greenwings that have been banded were trapped by banders primarily interested in species of greater importance to hunters such as mallards, pintails, or black ducks. It follows that the distribution of green-winged teal banding has been influenced more by the need to sample other ducks than by its own sampling needs. Table 1 summarizes bandings and recoveries by State, Province, and flyway for the period of study. A total of 106,366 green-winged teal was banded, of which 6,955 were recovered (6.5 percent). The greatest number was banded in California (22.7 percent), followed by Saskatchewan (14.3 percent), Oregon (9.3 percent), and British Columbia (7.9 percent). Almost 40,000 birds were banded in Canada and Alaska, mostly during summer and fall, and 44,000 were banded in the Pacific Flyway, leaving only 22,000 birds or 21 percent of all bandings in the other three flyways combined. (The term "flyway" in this paper relates only to that part of the migration routes in the United States.)

Table 2 records the individuals and agencies that banded 200 or more green-winged teal. The outstanding contribution of agencies like the Salton Sea National Wildlife Refuge, the Bear River Migratory Bird Refuge, and Ducks Unlimited and of individuals like Floyd Thompson, A. J. Butler, and G. C. Reifel is emphasized.

The location of banding stations which provided at least five recoveries is shown for different periods of banding in figure 1 (preseason), figure 2 (fall), figure 3 (winter), and figure 4 (spring).

Waterfowl Status Reports (1951-63) contain data obtained by the aerial breeding population survey of the major waterfowl breeding grounds. The procedures followed in this survey were described by Stewart et al. (1958). These reports also provide data on the distribution and size of waterfowl wintering populations from the winter survey. This survey is a cooperative effort involving Federal, State, and Provincial biologists as well as private individuals and covers Canada, the United States, and Mexico. Occasionally the West Indies and Central America have been surveyed. Essential data concerning the green-winged teal were taken from the Waterfowl Status Reports and were supplemented by unpublished data in the files of the Migratory Bird Populations Station.

Data on the size and distribution of the waterfowl harvest in the United States, obtained by an annual mail questionnaire survey, are published in the Waterfowl Status Reports. Since 1960-61, a wing collection survey has been conducted during the hunting season to measure species, sex, and age compositions of the harvest (described by Geis and Carney, 1961). Data on species in the harvest were reported by hunters on the mail questionnaire survey before 1960 and were in general agreement with results from wing collections. Wing survey data relating to green-winged teal were utilized and complemented by unpublished data in the Migratory Bird Populations Station's files.

Canadian Wildlife Service files in Ottawa were examined especially for data on sex and age ratios reported in bag checks.

Information about hunting regulations, sale of duck stamps, and refuge areas was examined to aid in the interpretation of recovery records from banded birds.

PROCEDURES

Banding Periods

Interpretation of banding data differs with the period of the year when the birds are banded. The periods used in this study were as follows:

1. Summer or preseason. -- May 1 to the beginning of the hunting season. Ideally, the breeding season should be considered separately and should include only the period prior to movement out of the breeding area. However, this is not practical since birds capable of flight are almost always of unknown origin. In addition, few adult ducks in the nesting phase of the breeding cycle have been banded. Therefore, to provide sizable samples of data, the summer banding period includes both the nesting season and late summer.
2. Fall or hunting season. -- October 1 in the United States and the opening of the hunting season in Canada (variable September dates) to January 15.
3. Winter. -- January 16 to February 28.
4. Spring. -- March 1 to April 30.

Reference Areas

Since, for the purpose of this report, it would be unproductive to study the migration and population dynamics for birds banded at each banding station, those stations located in the same general area and having a similar recovery distribution pattern have been combined and designated as a major reference area. In many cases, especially when a reference area was large, it was divided into minor reference areas, usually corresponding to States or Provinces. The summer and preseason banding locations were grouped in 15 major reference areas (fig. 5); the winter locations made up 7 reference areas (fig. 6). No reference area as such was defined for fall and spring banding, since the birds were in migration; but groups of stations with similar recovery patterns were combined, mostly on an easily identifiable State or local basis.

Recovery Distribution

Band recovery distribution patterns are shown on maps in the appendix as the number of recoveries per degree block of latitude and longitude. Except in one or two instances, the number of recoveries was inscribed directly on each block of the map when the total number was less than 100; when it was more than 100, the number of recoveries per block was shown by dot patterns of four different shades. Unless the legends specify differently, the recoveries include both first-hunting-season and later-hunting-season recoveries (see definition p. 6).

Band-reporting rates (see definition p. 6) may have varied among areas. Differences in band-reporting rates probably influenced the band recovery distribution most noticeably in the vicinity of a banding station. In comparing recovery distribution patterns, it was assumed that this difference was not critical.

Mortality Rates

Methods used to calculate mortality rates from band recoveries have been discussed by Hickey (1952) and Farner (1955). The latest methods were reviewed by Geis and Taber (1963). The composite dynamic method which we used assumed that deaths due to hunting make up the same fraction of the total deaths every year. This assumption is not met when changes in hunting pressure occur, but the combining of many years of banding reduces the possible errors arising from variable hunting pressures. It was also assumed that the rate at which hunters report bands recovered (band-reporting rate) did not vary appreciably from year to year. This assumption is probably not entirely valid since band-reporting rates probably decreased in the 1960's (Martinson, 1966a), but most of our study data represented years up to 1961. Mortality estimates were not calculated when total recoveries numbered 20 or less.

Definitions

Certain technical terms are used as follows:

Immature. -- In this study, "immatures" are young birds capable of flight that can be distinguished as hatched in the calendar year of banding. In the early banding records, all birds hatched in the calendar year of banding were called "juveniles." During the 1950's, young birds capable of flight were recorded as "immatures" and those not yet fledged were called "locals." Thus "immature" in this paper includes both the juvenile and immature designations of early years but not the present "local" category.

Local. -- Young bird unable to fly, that is, hatched locally.

Direct recovery. -- Recovery during the first hunting season after banding. In this case the term is applied only to bandings in summer or fall.

Indirect recovery. -- Recovery of summer- or fall-banded birds in the second or a later hunting season or of winter- or spring-banded birds in the first or a later hunting season.

Immature recovery. -- Bird banded and recovered as immature.

Adult recovery. -- Bird banded as local, immature, or adult and recovered as adult.

First-hunting-season recovery rate. -- Percentage of banded birds of any age which are recovered the first hunting season after banding.

Band-reporting rate. -- Percentage of recovered bands actually reported to the Bird Banding Laboratory.

Immature mortality rate. -- Percentage of the immature population estimated to have died between the beginning of the first and the beginning of the second hunting season after banding; since green-winged teal reach adulthood before the latter season, the rate involves a portion of the adult life.

Adult mortality rate. -- Percentage of the adult population estimated to have died each year.

Tertiary sex ratio. -- Sex ratio of young-of-the-year birds in the hunting harvest.

Quaternary sex ratio. -- Sex ratio of adult birds in the hunting harvest.

Harvest. -- Retrieved or bagged hunting kill.

Kill. -- Total hunting kill including retrieved birds (harvest) and those lost as cripples.

Relative recovery rate. -- The extent to which the band recovery rate of one age, sex, or population segment differs from the rate of another. It is used to measure the difference between groups in likelihood of being shot.

TAXONOMY AND DISTRIBUTION

Although this study is mainly concerned with the migration, harvest characteristics, and population dynamics of the green-winged teal in North America, it is appropriate to discuss the bird's taxonomy and seasonal distribution.

Taxonomy

The green-winged teal is distributed throughout the Northern Hemisphere, but encounters between the Eurasian and the North American population are only accidental. The two groups are distinguished by a few differences in the plumage of the male. The most obvious difference is the presence in the North American teal (male) of a broad vertical white band on the sides of the breast. This vertical band is absent in the Eurasian teal which has, instead, broad horizontal white streaks on the scapulars with a black line below.

The first two editions of the American Ornithologists' Union Checklist of North American Birds (1886, 1895) listed two species of green-winged teal: Anas crecca Linnaeus in Europe and Anas carolinensis Gmelin in North America. In the third and fourth editions of the A.O.U. checklist (1910, 1931), the same two species were still recognized but their generic name had been changed to Nettion. Peters (1931, p. 164), accepting the arguments of Phillips (1923, p. 211), assigned all green-winged teal to the same species, separating them at the subspecific level as Anas crecca crecca and A. c. carolinensis. In 1948, the resident population in the Aleutian Islands was described by Friedmann (1948) as Anas crecca nimia, being similar to the European teal except for its slightly larger size. Delacour (1959) recognized Peters' and Friedmann's subspecies: Anas crecca crecca, A. c. nimia, and A. c. carolinensis. In the most recent edition of the A.O.U. checklist (1957), Anas crecca crecca Linnaeus in Eurasia, A. c. nimia Friedmann in the Aleutians, and Anas carolinensis Gmelin in North America are recognized.

Although taxonomists do not agree on the specific status of the green-winged teal, there is no problem in management since the European and Aleutian teal are very rarely seen on continental America, and no banded American greenwing has been reported from Europe or Asia.

Subspeciation among green-winged teal in North America has not resulted; probably because birds from widely separated breeding areas are brought together on wintering grounds. Louisiana, for instance, is a wintering area for birds from breeding grounds as far apart as Alaska and Labrador. One teal banded in California in the fall was recovered 2 years later in Labrador. Since pairs are often formed on the wintering grounds, some birds, mostly males, may change from one flyway to another, thus creating a continental gene pool.

Distribution of Breeding Populations

The green-winged teal has a wide breeding range, perhaps the most extensive of all our waterfowl species. Because the breeding population is scattered and the birds are small, the species has been overlooked, or numbers underestimated, in most waterfowl surveys. However, its major breeding areas are surveyed annually and the index figures obtained in various ecological zones are summarized in table 3 and figure 7. The areas surveyed are not always comparable from year to year and thus the average population index for different areas is based on different numbers of years. In Quebec, for instance, aerial surveys were conducted in 1955 and 1956 and then discontinued until 1962. For areas which were surveyed each year, the average population index has been calculated using the most recent period of consecutive years.

The average population indexes and birds per square mile index for various survey areas (table 3) are based on birds actually recorded from aircraft flying at an elevation of 100 to 200 feet, without any attempt to correct for birds present but not seen or for visibility differences in the various ecological types surveyed. Consequently, the data are only crude indexes of abundance. Outside the breeding areas shown in figure 7, a number of States and all Provinces support breeding populations of lesser importance.

The highest density index of breeding green-winged teal (1.75 to 2.0 birds per square mile) was observed in three neighboring areas, the Athabasca Delta (northern Alberta), the Slave River parklands, and east of the North Arm of Great Slave Lake (District of Mackenzie). The next highest density index (1.1 birds per square mile) was in the aspen parklands of Alberta. The density index was about 0.5 bird per square mile in the Old Crow Flats of Yukon, in the Hay Lake-Fort Nelson region of northern Alberta, in the Saskatchewan parklands, and in the prairie region of Alberta. The lowest density index was in the boreal forest of Ontario and Quebec and in the prairie sections of Minnesota and the Dakotas. Aerial surveys have revealed the presence of breeding green-winged teal in all areas surveyed except the tundra between the Mackenzie and Anderson Rivers.

In general, these observations indicate that green-winged teal prefer the wooded ponds of the parklands rather than the prairie potholes. The density of breeding teal decreases from the rich river deltas of northern Alberta and southern Mackenzie District to the aspen parklands of Alberta and Saskatchewan and then to the shortgrass prairies. There is also a decrease in density from northern Alberta to southern Manitoba.

The observations also corroborate Munro's (1949) description of the preferred nesting habitat as "one of grassland, sedge-meadows or dry hillside containing aspen or brush thickets or open woods adjacent to pond or slough." Even though the green-winged teal seems more attracted

to the northern breeding grounds, water conditions in the prairies appear to affect its distribution to a certain extent. Selected breeding population indexes (table 4) show that in 1955 and 1956, when there was much water in the prairies, the population index attained its maximum in southern Saskatchewan and the prairie region of the North-Central States. In the dry years of 1959-61 the prairie index decreased considerably. Conversely, the highest population index in northern Alberta and the Northwest Territories was in 1959, suggesting that many ducks moved beyond the dry prairies to the more stable northern deltas. The breeding population in southern Alberta was not as much affected by the drought as that of southern Saskatchewan. Southern Manitoba consistently supported such a small breeding population that changes were not discernible.

It is difficult to explain the wide variations in the annual breeding population index, particularly the sharp drop in 1962 and the quick recovery in 1963. Present waterfowl surveys were not designed to detect changes on an annual basis for species such as the green-winged teal and they probably do not measure these changes with any precision. However, survey data are adequate to measure the relative abundance of the species in different ecological biomes and to reveal long-term population trends.

Besides the major breeding grounds surveyed with aircraft each year, many other areas are known to support green-winged teal during the breeding season. Although no data are available to ascertain the importance of these other areas, a summary of the breeding records is presented since it will help in understanding the migration study.

In summer green-winged teal are widely distributed through the interior of British Columbia (Munro, 1949). The populations are small, particularly in the south; the largest nesting population is found in the Cariboo and Peace River parklands. In Washington, green-winged teal are fairly common in the eastern half of the State where they represented 4.8 percent of 16,667 duck broods observed between 1948 and 1957 (Yocom and Hansen, 1960). The green-winged teal breeds sparingly west of the Cascades. In Idaho and Oregon, it is a rare breeding bird, but in California, it is fairly common in the Tule Lake-Lower Klamath region and in the northeastern corner of the State. In Utah and Nevada, several breeding pairs are reported each year (Waterfowl Status Reports, 1951-63).

In Central Flyway States, (except North and South Dakota which are included in the annually surveyed areas) the green-winged teal is an uncommon breeder. It is a regular summer resident in Colorado, Wyoming, Nebraska and Montana.

In the Mississippi and Atlantic Flyways, the green-winged teal is a regular but not abundant breeder in the Northern States. It is fairly abundant in the regions of Canada not covered by the annual aerial survey. In Newfoundland (Peters and Burleigh, 1951), it seems to be second to the black duck in abundance as a breeder. It is also a common resident in

Nova Scotia (Tufts, 1961) and New Brunswick (B. S. Wright, pers. comm.) where its numbers appear to have increased in recent years. On the west coast of James Bay and south Hudson Bay, Manning (1952) reports that it is probably the second commonest surface feeding duck and breeds in the marshes near the edge of the bush bordering the Bays. However, Lumsden (1959) believes that the green-winged teal is far less abundant in this area than the black duck and pintail.

The northern limit of the breeding range is believed to coincide approximately with the tree limit, even though some teal have been observed in the tundra as far north as Baffin Island (Macpherson and McLaren, 1959).

Distribution of Wintering Populations

The green-winged teal is so widely distributed in winter that a complete inventory is impossible. Serious doubts as to the accuracy of the winter surveys for measuring population size or trend arise from frequent lack of agreement with the breeding population indexes (fig. 8). Most waterfowl workers now agree that the winter survey data can be useful to establish population trends for several species of ducks and geese. However, when dealing with a species like the green-winged teal, which may winter as far south as Venezuela and the West Indies, shifts in wintering populations may seriously reduce the value of the survey as a measure of trend in population size.

The survey data for green-winged teal are used to show the general distribution of the wintering birds in the United States and Mexico. They also show gross trends in population size.

Numbers of green-winged teal observed during the winter survey from 1948 to 1963 are given in table 5. The areas covered by the surveys were not always the same but the population estimates have been adjusted to make them comparable.

One noticeable feature of the data is the relative consistency of the yearly estimates during the periods 1948 to 1955 and 1958 to 1963. Populations observed in the latter period were about 70 percent higher than in the former. Several factors which may explain this increase are:

1. A real increase in the green-winged teal population. The breeding population index (table 4) does not corroborate this hypothesis, even though the peaks in both surveys occurred in 1959 (fig. 8).
2. A general shift of wintering birds from unsurveyed areas (mainly Central America and northern South America) to Mexico and Southern United States. This is unlikely since

the occasional surveys south of Mexico have revealed relatively small numbers of wintering green-winged teal: 13,000 in Nicaragua in 1951, 5,000 in Cuba in 1954, and 40,000 in Colombia and Venezuela in 1960. Band recoveries confirm this finding since only two bands were recovered south of Mexico; one in Venezuela and one in British Guiana (a relatively large volume of blue-winged teal bands are reported from this area indicating that recoveries are possible).

3. Changes in the survey techniques. No major change was made in the methods of conducting the surveys, but it is possible that the censusing ability of the biologists and survey coverage has improved over the years.

Winter survey data were averaged for the period 1959-63, and wintering areas which supported at least 1 percent of the observed population are delineated in figure 9. The major wintering areas are the Gulf Coastal marshes of Louisiana and eastern Texas (43.6 percent), the west coast of Mexico, mostly between Los Mochis and Manzanillo (19.3 percent), and the Central Valley, Imperial Valley, and Humboldt Bay in California (16.3 percent). Approximately 80 percent of the wintering green-winged teal are found in these areas. Areas of minor importance are the valley of Mexico and the Central Highland Lakes of Mexico (6.3 percent), South Carolina (4.2 percent), Skagit Bay in Washington (1.7 percent), Arkansas (1.9 percent), and the east coast of Mexico, mostly in the Tampico and Alvarado Lagoons (1.2 percent). These minor areas account for nearly 15 percent of the wintering green-winged teal. The remaining birds (5 percent) are spread out as far north as Alaska and Newfoundland, on the sea coasts, and anywhere south of the dotted line in figure 9.

The distribution of wintering populations indicates a preference for coastal marshes, especially the marshes and bayous surrounded by rice fields in Louisiana and eastern Texas. In Chesapeake Bay, Stewart and Robbins (1958) state that the green-winged teal is found on tidal ponds and creeks of brackish marshes; also occurs more sparingly in salt marshes, on estuarine waters, and on inland ponds, lakes and streams. Jewett et al. (1953) state that though greenwings are occasionally found on mud flats, they avoid the salt water in Washington.

MIGRATIONS AND DISTRIBUTIONS OF HUNTING KILL FROM REFERENCE AREAS

In this section, migrational patterns and distribution of the hunting kill from various breeding, wintering, and migration areas are discussed.

Summer or Preseason Bandings

It is important to re-emphasize that summer banding is not synonymous with banding on the breeding grounds. Birds banded as locals are the only ones specifically referable to breeding areas, and their numbers are

few (there were only 74 direct recoveries prior to 1963; Lensink, 1964). Also some recoveries from early fall banding were used when recovery patterns appeared to be similar to those from summer banding. Therefore, some of our conclusions on the distribution of green-winged teal from the breeding grounds may be wrong. Table 6 shows the 15 major summer reference areas, numbers of greenwings banded at important locations and refers to appendix tables and figures recording the band recovery data. Band recovery distributions include data from all age and sex groups of birds, but when there were enough recoveries, data for separate age and sex groups are shown in appendix tables. The numbers of all distribution maps and tables in the appendix are identified with an "A."

The study of recovery distributions of green-winged teal banded during the summer and preseason period resulted in the following conclusions. Greenwings breeding east of James Bay migrated mostly to the Atlantic Flyway with only a few moving into and through the Mississippi Flyway. Between 35 and 50 percent of the kill of these birds was in Canada.

Green-winged teal breeding or summering in Alaska, the Northwest Territories, the Prairie Provinces, and the Rocky Mountains made up a second group which contributes birds to the three western flyways. These populations distribute themselves widely in the winter. For example, birds from Alaska and birds from Manitoba may be found wintering from California to Louisiana. Only a small part of the hunting kill of these populations is taken in Canada. The most important harvest locations for these greenwings are Minnesota, the gulf coast of Louisiana and Texas, the Great Salt Lake Valley, and the Central Valley of California.

There has been little or no banding in the region between eastern Quebec and western Manitoba, and almost nothing is known of populations there. This is evident in the paucity of band recoveries from greenwings in Michigan, Illinois, Indiana, and Ohio, where the harvest of this species is substantial; with data presented later in this report, these facts suggest that a significant population of greenwings has not been sampled by banding.

Fall Bandings

Recovery data from fall-banded green-winged teal are difficult to interpret. The birds are in migration and are often subjected to hunting before they can disperse from the banding site. Recovery data from fall bandings were used (1) when banding was done in northern areas or other locations where shooting pressure was low, (2) when it involved a population not sampled in summer banding, and (3) when the data could help explain the kill distribution or migration of a succession of population units going through a single banding station. Table 7 records banding

periods, numbers of birds banded, and major banding locations and refers to appendix tables and figures containing recovery distributions for the reference areas. In many cases fall banding was conducted for 3 or 4 months; when data appeared similar throughout the period they were pooled, but when variations were evident they were detailed in the tables. When numbers of recoveries were adequate, direct and indirect distributions were shown on separate maps.

Recovery data from the fall banding helped clarify some migration patterns suggested by data from summer banding. These data suggested that there was a minor exchange of birds between the Atlantic and Mississippi Flyways. Five fall-banded green-winged teal were recovered in the James Bay region in the spring and summer recoveries. These birds had been banded in Wisconsin, Minnesota, Illinois, Missouri, and Maryland. Because no summer-banded greenwings had been recovered in the James Bay region, it was again suggested that an important part of the green-winged teal flight in the Mississippi Flyway represents a population that breeds in Ontario and western Quebec and has not been sampled by banding. There was also a suggestion that early fall arrivals in Louisiana pass through the Mississippi Flyway, whereas late arrivals come from the Provinces north of the Central Flyway.

Winter Bandings

Winter banding samples populations on their wintering grounds, and its management value is great, especially for a species like the green-winged teal for which adequate sampling by banding of its breeding grounds is not easily accomplished. Although most major wintering areas have been sampled, winter banding of greenwings has not been evenly distributed; 71 percent of the banding has been done at Salton Sea in California, which is not the most important wintering area. Winter banding locations were grouped to form seven major reference areas (fig. 6). Table 8 contains data on banding locations and numbers of birds banded as well as appendix tables and maps that should be referred to for recovery distribution data.

Winter banding was not adequate in most areas to provide a basis for drawing specific conclusions. A general observation is that the wintering grounds constitute the major harvest area for wintering populations of green-winged teal. This concentration of harvest in wintering areas may result from the all-adult sample; Stewart et al. (1958) observed that canvasback adults had a tendency to be shot close to their wintering grounds. Winter bandings of greenwings were enough in the Pacific Flyway to show a difference in characteristics between birds wintering in the Puget Sound vicinity and California. Green-winged teal wintering near Puget Sound appear to breed chiefly in Alaska and have an even sex ratio in trapped samples. Wintering birds in the Imperial Valley of California

probably breed in the Northwest Territories, Alberta, and Saskatchewan. Trapped samples in this area suggest a preponderance of males (73 males: 27 females).

Spring Bandings

The spring banding period used in this report is March and April, when northward spring migration is presumably in progress. Some reference areas used in examining these data coincide with winter reference areas but the green-winged teal banded are not necessarily the winter residents of the area. Although data from spring banding, like those from fall banding, are difficult to interpret, they provide an opportunity to study some population segments which were not sampled by summer or winter banding. Most spring banding was done in the Pacific and Central Flyways. Only a few data are available for birds in the Mississippi Flyway and practically none for Atlantic Flyway greenwings. Table 9 contains data on numbers of green-winged teal banded and banding locations and refers to appendix tables and maps showing recovery distributions.

Spring banding done from the Texas and Louisiana gulf coast north to South Dakota resulted in recovery distributions of which significant portions were in the Pacific Flyway (between 8 and 33 percent). This suggests that a segment of the green-winged teal population migrates south in the fall through the Pacific Flyway and then north in the spring through the Central and Mississippi Flyways, somewhat like the counter-clockwise migration of the pintail described by Low (1949). Results of spring bandings in the Puget Sound area were similar to those of winter banding in that area, suggesting a relatively confined population breeding in Alaska and British Columbia and wintering on the sound.

Summary of Migration Patterns

The green-winged teal has a very extensive breeding range and, during its southward migration in the fall, it is available to waterfowlers throughout Canada and the United States, and in many Mexican States. The migration routes of birds breeding thousands of miles apart often bring them together at staging points or on wintering grounds. Thus the distribution pattern is complex. Consideration of all the band recovery data gives a general understanding of the flyways used by greenwings and even permits the identification of certain population units. Discussions of kill rate and mortality of each migrating group later in this report may help to clarify the situation.

Most green-winged teal breeding east of James Bay winter along the Atlantic coast, where the main harvest zone lies between New Jersey and South Carolina. The routes used for that migration are along the New

England coast and the St. Lawrence Valley. A secondary route is down the Hudson River Valley or through the Finger Lakes country and by the Susquehanna River to Chesapeake and Delaware Bays. Some birds migrate as far south as Florida. Some move into the Mississippi Flyway through the Great Lakes waterway. The data suggest that very few of the birds breeding west of James Bay reach the Atlantic coast, but more winter banding on the Atlantic coastal areas is necessary to ascertain the proportion that uses that flyway. A characteristic of the Atlantic Flyway flight is that between 25 and 50 percent of the harvest is taken in Canada, particularly in the Maritime Provinces.

The green-winged teal banded in Manitoba, Saskatchewan, and Alberta, and in the Northwest Territories, migrate south along the border of the Central and Mississippi Flyways to the gulf coast or southwest through Montana, Idaho, and the Great Basin to California and Mexico. In Manitoba and Minnesota, the southward flight prevails over the southwestward flight, but further west the southwestward flight becomes more important. From Alberta, 69 percent of the recoveries are in the Pacific Flyway. Band recoveries suggest that the Central Flyway receives many more green-winged teal than the Mississippi Flyway, but there is good evidence that an important population breeding in northern Ontario has not been banded. The main wintering area in the Mississippi Flyway is the coastal marshes of Louisiana, and that in the Central Flyway is the coastal marshes of eastern Texas. An unknown portion of birds using these two flyways migrate south to Mexico.

West of the Continental Divide, there is a distinct population that breeds in Alaska and winters in the Puget Sound area and on the coast as far south as Oregon. This population migrates partly along the coast and through the central plateau of British Columbia. But all the Alaska breeding population does not winter in the Puget Sound unit; many birds migrate through central British Columbia to interior Oregon. From there, they may fly down the Columbia River to the coast, or south to central California, or by the Bear River marshes of Utah to central and southern California. No banded green-winged teal have been reported from Siberia. The Salt Lake Valley is a crossroads for migrants from Alaska to Manitoba, and concentrations of teal assemble there in the fall. From there, besides the flight to the Central Valley of California, there appears to be a movement south to the Imperial Valley and Mexico.

The Central Valley of California is the terminus of migration of many thousands of teals coming from the north. Other teals moving through California continue on into Mexico. From there, they migrate north through the Central Flyway in the spring. Another group, after flying through Arizona and New Mexico, may swing east in the fall to winter in Oklahoma or Mexico. The Central Valley draws some of its wintering birds from Alaska, but the Imperial Valley population appears to be derived from

the Northwest Territories and the Prairie Provinces. The wintering population in Mexico arrives mostly through the Central Flyway and the Imperial Valley.

HUNTING KILL OF GREEN-WINGED TEAL

Since adequate records have been available, green-winged teal have comprised about 10 percent of the total duck harvest in the United States and a significant part of the hunters' bag in Canada. The following discussion is concerned with the size and distribution of the green-winged teal harvest, the relative importance of this species in the total duck harvest, factors affecting the harvest, age and sex differences and chronology of the harvest.

Size and Distribution of Harvest in the United States

The harvest of green-winged teal by flyway from the mail questionnaire survey for 1952-63 is in table 10. Annual harvest varied less in the Pacific and Atlantic Flyways than in the Mississippi and Central Flyways, where there was a sharp decrease in 1959. The annual retrieved kill in the United States averaged about one million green-winged teal until 1959. Since 1959, it dropped to less than half a million in 1962 and subsequently increased in 1963-64 to the 1959 level of three-quarters of a million.

Until 1959 the distribution of the harvest among flyways was fairly constant; about 95 percent was almost equally divided among the three western flyways and the remainder was in the Atlantic Flyway. After 1959, the fractions of the harvest in the Pacific and Atlantic Flyways increased at the expense of the other flyways.

The proportion of the total harvest of green-winged teal in each State and flyway, 1960-64, is in table 11. During 1960-64, about 50 percent of the total harvest was in the Pacific Flyway, 20 percent each in the Central and Mississippi Flyways, and 10 percent in the Atlantic Flyway. More green-winged teal (30 percent of the total) were bagged in California alone than in any of the three eastern flyways.

In the Pacific Flyway, 60 percent of the harvest was in California. In the Central Flyway, more than 50 percent of the green-winged teal harvest was in Texas (32 percent) and Kansas (22 percent), the other important States were Oklahoma, Nebraska and South Dakota with 10 percent each. In the Mississippi Flyway, Minnesota (32 percent), Wisconsin (18 percent), and Iowa (10 percent) accounted for about 60 percent of the harvest. Another 10 percent was shot in Louisiana. In the Atlantic Flyway, 65 percent of the harvest was about equally divided among Maine, New York, New Jersey, Delaware, North Carolina, and Florida.

Table 12 shows the relative importance of the green-winged teal in the harvest in States and flyways. The flyway averages were weighted according to the ratio between the number of wings received from each State and the harvest in that State. Between 1960 and 1963, green-winged teal made up from 5.9 to 8.3 percent of the total duck harvest in the Atlantic and Mississippi Flyways; they represented from 10.7 to 13.6 percent of the ducks bagged in the Central and Pacific Flyways.

In most Pacific Flyway States the greenwing ranked third in the bag after mallards and pintails. In 1962 and 1963, it was the most important species in the bag in Arizona, surpassing even the mallard. In the Central Flyway, it was second only to the mallard. Its relative importance was particularly striking in Kansas where its harvest sometimes equalled that of mallards. It constituted over 10 percent of the bag in Texas, Oklahoma, New Mexico, Colorado, and Nebraska, but was less important in the Northern States. Green-winged teal were relatively less important in the Mississippi than in other flyways; Iowa was the only State where they represented over 10 percent of the duck harvest. More important species in that flyway were mallards and wood ducks, and sometimes blue-winged teal, ringnecks or lesser scaup. In the Atlantic Flyway, the green-winged teal made up about 15 percent of the duck harvest in Maine and 20 percent in Delaware. Elsewhere, its importance varied considerably but made up a significant part of the bag in New Jersey, North Carolina, Virginia, Vermont, New Hampshire, and Florida.

During 1960-63, there was no apparent change in the rank of greenwings among ducks harvested, even though major changes were made in hunting season length, bag limit, and restrictions on other species.

Harvest Distribution Versus Band Recovery Distribution

A comparison of the distribution of the kill and the distribution of band recoveries is made in table 13. The two distributions were not expected to be identical because the wing collection data are for the period 1960-63 while the banding data relate to 1946-61 and because the harvest distribution has shifted since 1959 from the Central and Mississippi Flyways to the other flyways. The comparison strengthens a previous conclusion that an important proportion of the birds shot in Wisconsin, Michigan, Iowa, Illinois, Indiana, and Ohio are from a population segment not sampled by preseason banding. From 10 to 14 percent of the green-winged teal harvest in the United States was made in the States mentioned above, but only 3 percent of the banded birds were recovered there. We suspect that these birds shot in these States breed in the vicinity of James and Hudson Bays in northern Manitoba and northern Ontario.

Factors Affecting the Hunting Kill

Among the factors which may have affected the kill of green-winged teal, relative size of the annual population, number of hunters, and hunting regulations will be discussed.

A comparison was made between the breeding population index and the kill estimate for each year since 1955 (table 14). We assumed that the size of the breeding population in the spring was an index to the number of birds available to hunters the following fall. There was no apparent correlation between breeding population index and kill between 1955 and 1959. The highest population index was recorded in 1959, but the kill in 1959 dropped. Since 1960, the agreement was somewhat better. Since the reliability of the annual breeding population index for green-winged teal is doubtful and the effect of annual variations in production on fall population size was not considered, we cannot firmly conclude that there is no relation between population size and kill.

The number of hunters, as expressed by numbers of duck stamps sold (table 14), was compared to the harvest estimates. Changes in the numbers of hunters corresponded to changes in harvest from 1956 to 1963. However, a direct cause and effect relation does not necessarily exist between the two, because the variations in the number of hunters were related to hunting regulations during that period. The decision to buy a duck stamp seemed to be directly influenced by the "liberalness" of hunting regulations. Increased numbers of hunters resulted from liberal regulations and since a relatively small fraction of the hunters kill most of the ducks, numbers of hunters may be the least important cause of the regulations-size of kill relationship.

The sharp drop in the total harvest from 1959 may have been the result of lower hunting pressure and also the decreasing breeding population. In the Mississippi and Central Flyways (fig. 10), the harvest dropped steadily from 1959 to 1962 as did the number of hunters, but at the same time the length of hunting seasons was reduced from 70 to 25 days and the daily bag limit from 4 or 5 to 2 birds. In 1963, with a 35-day season and a 4-duck bag limit, the number of hunters as well as the harvest increased. There is no doubt that the kill was affected directly or indirectly by changes in hunting regulations in these two flyways. In the Atlantic Flyway, the harvest was so low that variations were not detectable. In the Pacific Flyway, variations in harvest showed a general correlation with the number of hunters. In that flyway, the hunting regulations were not made as restrictive during 1959-62 as they were in the Central and Mississippi Flyways and the number of hunters did not decrease as much.

To examine the effect of these factors on kill at the State level, data for Minnesota and Kansas were examined (table 15). In both States, variations in harvest paralleled variations in season length, bag limit, and numbers of hunters. In Kansas, changes in hunting pressure did not

affect the relative importance of green-winged teal in the harvest. The season length, bag limit, and number of hunters remained practically the same in Minnesota in 1961 and 1962, except that hunters were allowed to take only one mallard daily in 1962. In that year the total duck harvest in Minnesota decreased 32 percent, but the kill of greenwings decreased 68 percent, and their relative importance in the bag dropped from 12.1 percent to 5.8 percent. This suggests that the green-winged teal did not serve as a buffer when other species were scarce. However, the decreased greenwing harvest and proportion of this species in the bag may have resulted from the very low breeding population that year (table 14). Thus the whole picture is far from clear, but there is little doubt that the size of the green-winged teal kill trended in the same direction as changes in hunting activity.

Hunter Selectivity

It has been suggested that hunters select against green-winged teal when other ducks are available. If this were true, the teal's relative importance in the bag would be inversely related to hunter success. When this hypothesis was tested, no relation was apparent on a continental scale. On a flyway basis, a negative relationship was apparent but not statistically significant in the Pacific ($r = -0.57$, $p < 0.90$), and the Central Flyway ($r = -0.46$, $p < 0.90$). In the Mississippi Flyway, there was no apparent correlation. We concluded that the green-winged teal was usually harvested in relation to its availability, even in the States which had high hunting success.

Estimate of Canadian Kill

There was no waterfowl kill survey in Canada comparable to the one in the United States during the period of this study. An estimate of the Canadian kill can be obtained if the distribution of recovered bands between Canada and the United States and kill in the United States are known. For this purpose, all adult recoveries of green-winged teal were examined to obtain the distribution of the adult portion of the kill between Canada and the United States. Of the 3,615 indirect band recoveries of adults, 8.4 percent (304) were reported in Canada, 90.0 percent (3,249) in the United States, and 1.7 percent (62) in Mexico.

The average annual harvest of green-winged teal in the United States during 1955-63 was about 850,000. The age ratio in the United States harvest, 1961-64, averaged 1.55 immatures per adult (table 33). Assuming that this age ratio would apply to 1955-63, the average annual harvest of adults in the United States was about 330,000.

Based on the recovery distribution and the kill in the United States, the average annual kill of adult green-winged teal in Canada was about 30,800 birds, and in Mexico 6,200.

No measurement of age ratio in the Canadian harvest is available. However, it will be shown that immatures were more vulnerable to hunting in Canada than in the United States, and the age ratio in the harvest certainly was greater there. Age ratios for States (table 33) show a variation from 2.0 to 4.5 immatures per adult in the Northern States bordering Canada. Assuming that the age ratio was as high or higher in Canada, total kill estimates for age ratios of 3.0, 4.0 and 5.0 were 123,200, 154,000 and 184,000, respectively. Thus if the age ratio in the Canadian kill was equal to 4.0 (as indicated by occasional bag checks -- section on age ratios and production rates), the total green-winged teal kill in Canada would have been about 18 percent of the United States kill. The age ratio in Mexico is not known but band recoveries suggest that the total kill there was not very important.

Considering banding data and the United States harvest by flyway, the distribution of the greenwing harvest in Canada can be determined. In the east, 32 percent of indirect band recoveries were in Quebec and the Maritime Provinces and 62 percent in the Atlantic Flyway. North of the Central and Mississippi Flyways, 2.5 percent of indirect recoveries were in Canada (the Prairie Provinces). In the west, 8.6 percent of recoveries from birds banded in the Pacific Flyway and Canada west of the Rockies were in Canada. These band recovery data coupled with harvest estimates for the United States flyways suggest that the Canadian harvest is distributed thusly: 30 percent in Provinces from Ontario eastward and 70 percent in the Prairie Provinces and British Columbia.

Sex and Age Differences in the Harvest

Some variations in the kill pattern of green-winged teal were related to the age and sex of the birds. These variations were evident in both the banding data and the wing survey data.

Banding Data

Immatures were relatively more likely to be shot than adults in the vicinity of the banding site, especially in northern areas. The recovery distribution of green-winged teal banded in Manitoba (table A-4), for example, shows that 32 percent of the immature recoveries (but only 5.7 percent of the adult recoveries) were in Canada. The same tendency is shown in data for Baie Johan Beetz, Quebec (table A-2), Newfoundland (table A-18), Minnesota (tables A-5 and A-24) and Alaska (table A-10).

This greater vulnerability of immatures has been reported by previous workers for mallards and black ducks (Smith and Geis, 1961) and canvasbacks (Geis, 1959).

When the sample of adults was large enough to compare the recovery pattern of each sex, it was observed that the characteristics of adult females appeared to be more like those of immatures than of adult males. For instance, at Baie Johan Beetz (table A-2), 52.6 percent of the adult female recoveries compared to 28.4 percent of the male recoveries were in Canada. Data from preseason bandings in Saskatchewan (table A-7) and in Alaska (table A-10) showed a similar characteristic.

The kill patterns of immature and adult teal varied conspicuously in each flyway. Adults banded in each of the three summer reference areas of the prairies were more likely than immatures to be recovered in the Pacific Flyway (table 16). However, the percentages of immature and adult recoveries for the Mississippi and Central Flyways included the Northern States where immatures are more vulnerable, whereas in the Pacific Flyway these green-winged teal became available only in Utah and California. To offset this difference and to make the data comparable with those for the Pacific Flyway, the percentages of immature and adult recoveries were calculated for the southern tier of States of the Mississippi and Central Flyways (table 17). Even with this approach, the probability of the adults being taken in the Pacific Flyway was higher than that for the immatures. It seems unlikely that young birds would shift migration routes when they attained adulthood and the explanation which we suggest is that immature birds may join the Pacific Flyway in equal proportion to the adults but they are less vulnerable than adults to shooting in Utah and California because they spend a shorter period there.

Among adults banded in Saskatchewan and Alberta, the proportion of males to females recovered in the Pacific Flyway was the same as that for males and females recovered in the Central Flyway (however, the number of recoveries of females was very small). In the North Central reference area, 9 percent of 33 adult females were reported in the Pacific Flyway compared to 16 percent of 88 males. Thus the difference between the adult male and adult female harvest patterns by flyway may be similar to that between immatures and adults.

Wing Survey Data

Age ratios in the harvest were generally higher in Northern than in Southern States, and lower in the Pacific Flyway than in other flyways (table 32). Sex ratios of adults tended to be unbalanced in favor of females in Northern States, turning gradually in favor of males in Southern States (table 35). An exception was in the Central Flyway where males were always preponderant in the kill. In the immature segment of

the kill, no trend from north to south could be detected in the sex ratio (table 36). Females were preponderant in the Atlantic and Pacific Flyways whereas the sex ratio was about even in the other two flyways.

Chronology of Migration and Harvest

Migration

The chronology of migration was difficult to determine but, using band recovery data supplemented by other observations, some knowledge was gained. During fall migration in the Atlantic Flyway, the birds are spread from Labrador to Florida. The flight takes place in October and November. Some green-winged teal are observed as far north as Quebec City in early December and some winter in Nova Scotia. The first birds to arrive in Louisiana in October appear to have followed the Mississippi Flyway, and their migration takes them south to Mexico. Most teal that winter in Louisiana come south later through the Central Flyway. Yancey et al. (1957) counted waterfowl throughout the Mississippi Flyway twice a month in 1956 and reported that: although early movements were noted (principally in Minnesota and Illinois), the main flight moved into the southern region of the flyway in early November; by mid-November, 510,000 greenwings were censused and 86 percent of these were in Louisiana marshes; 400,000 were counted on January 15 with 90 percent in the coastal marshes of Louisiana; few greenwings were found at any time in the upper sections of the flyway; it appeared that many of the green-winged teal move down the Central Flyway and then shift eastward to their wintering grounds in the coastal marshes of the Mississippi Flyway.

In the Central Flyway, Heit (1948) reports that numerous green-winged teal appear in the Texas coastal marshes in late November and early December. The species has almost completely left the Prairie Provinces by early November.

Concentrations in the Pacific Flyway start to build-up in Utah in August, indicating an early migration from the breeding grounds.

First birds to migrate in all flyways are the adult males. The adult females and immatures apparently remain longer in the Northern States and in Canada.

The green-winged teal is an early spring migrant. It reaches Montreal in early April and Manitoba in mid-April (Hochbaum, 1944). Four banded birds were reported shot in Alaska in the first half of April.

Banding data. The greater vulnerability of adult females and immatures in Canada and the northern tier of States is probably due to a difference in the chronology of migration. The monthly distribution of band recoveries during the hunting season (table 18) shows that immatures were more likely than adults to be shot in September and October; conversely, adults suffered a heavier kill than immatures in December and January. There was a tendency for adult females to be recovered earlier in the hunting season than adult males.

Wing survey. Table 19 shows wing collection data by month for hunting seasons 1960-63 in the Atlantic and Mississippi and for 1961-63 in the Central and Pacific Flyways. One conclusion can be drawn from the data: green-winged teal were available to the hunters of each State when the hunting season opened and remained available throughout the season. The bulk of the harvest was in the first 2 weeks, especially in northern areas. In wintering areas like Washington, Oregon, California, Florida, South Carolina, and Texas, the harvest was more evenly distributed throughout the season.

DERIVATION OF HARVEST

Banding data can provide information on the source of the kill in different harvest areas. For instance, properly weighted band recovery data can be used to determine the proportion of the green-winged teal shot in California that comes from the Prairie Provinces, from Alaska, or from the Northwest Territories. Geis and Taber (1963) described the procedure and defined the conditions that must be met to use band recovery data for determining source of harvest. The conditions are:

1. All "populations" contributing to the kill in the harvest areas must be represented by an adequate sample of marked birds.
2. Population data must be available to reflect the relative size of each "population" contributing to the kill.

In this study we did not attempt to determine the derivation of harvest because all populations were not banded and the distribution of the breeding populations didn't correspond to their distribution at the time of banding. For example, the breeding range of the early migrants banded in Utah and California is poorly known.

Table 20 is presented to show the origin of banded birds recovered by State and Province and includes all recoveries from green-winged teal banded from May 1 to the opening of the hunting season. The table does not give the relative importance of banding areas to harvest zones because the band recoveries were not weighted.

RATE OF HUNTING KILL

The annual continental harvest of green-winged teal has averaged about one million birds, 1955-63, although shooting pressure varied in time and space. Banding data can be used to measure the rate of harvest, the rate of hunting kill and variations in rates of kill. The direct recovery rate from summer or preseason banding constitutes an index of the percent of the population bagged by hunters (harvest rate). The direct recovery rate, corrected for band-reporting rate (the proportion of recovered bands actually reported to the Bird Banding Laboratory) is the harvest rate. The recovery rate corrected for (1) band-reporting rate and (2) crippling loss is the kill rate.

Average Recovery Rates

First-year recovery rates of summer-banded green-winged teal are summarized in table 21 for each major or minor reference area from which there were sufficient recoveries. Direct recovery rates for preseason bandings are summarized for each sex in table 22; for winter banding, in table 23, and for spring banding, in table 24. There were variations in recovery rates related to the location of banding, age and sex of the birds, the season or period of banding, and the period of years during which the banding was done.

Variations in Recovery Rates Among Banding Reference Areas

The highest direct recovery rates for both immature and adult teal, varying between 7 and 12 percent (table 21), were for birds banded during the summer in California, Oregon, and Washington. Adults banded in the Colorado-Wyoming reference area had the lowest recovery rate (0.9 percent). Direct recovery rates for immatures and adults banded in Alberta and Saskatchewan were low, about 3 percent, whereas rates for greenwings banded in Alaska, the Rocky Mountain reference area, and Manitoba eastward to the Atlantic coast were intermediate.

Birds banded in Saskatchewan had a very low recovery rate in Canada (using only recoveries from Canada) compared to that of Manitoba-banded birds. This difference may be due to the difference in hunting methods in the two areas. Much of the duck shooting in Saskatchewan is done in stubble fields while in Manitoba hunting is done primarily in big marshes.

Data from winter and spring bandings (tables 23 and 24) reveal the same tendency towards lower recovery rates for birds banded in the Central and Mississippi Flyways than for those banded in the Pacific (except Idaho, Utah, and Nevada) and the Atlantic Flyways. These comparisons are made with the assumption that the band-reporting rate was the same throughout the continent and this assumption is probably not valid.

Variations in Recovery Rates Associated with Age

Bellrose and Chase (1950), Smith and Geis (1961) and Geis (1959) showed that, among mallards, black ducks, blue-winged teal, and canvasbacks, immatures were more vulnerable than adults to shooting. Preseason banding data for reference areas having adequate samples show that this differential kill rate between immatures and adults is also characteristic of the green-winged teal (table 21). Immatures were 2.1 times more likely to be shot than adults in bandings from Baie Johan Beetz, Quebec. The immature:adult relative recovery rate was 2.3 for Manitoba bandings, 1.8 for Alaska, 1.3 for Puget Sound, and 1.9 for Salt Lake Valley bandings. There were no marked differences in the recovery rates of adults and immatures banded in Saskatchewan, Alberta, and central Montana. This may be true because, as discussed earlier, the adults from this region tended to be recovered in the Pacific Flyway where recovery rates are high while the immatures tended to be recovered in the Central Flyway where recovery rates are generally low. Among greenwings banded in the Imperial Valley, adults were more vulnerable to hunting than immatures.

The immature:adult relative recovery rate for green-winged teal was not constant among all harvest areas. For example, birds banded in the Alaska reference area were harvested in Canada, Mexico, and the three western flyways. The relative recovery rate for these birds in Canada (using only recoveries from Canada) was 4.0, in the Mississippi Flyway 2.8, in the Central Flyway 1.3 and in the Pacific Flyway 2.1. This is again shown in tables 25 and 26 with the relative recovery rates in various harvest areas from banding in the three Prairie Provinces. Among birds banded in the Prairie Provinces, immatures were more likely to be shot in Canada, Mexico, and the Central Flyway, but the adults were more likely to be taken in the Pacific Flyway.

If the same weight is given to each reference area where at least 200 teal were banded, the average direct recovery rate of adults was 4.6 percent and of immatures, 6.3 percent. Thus the immature:adult relative recovery rate for all teal banded and recovered in both the United States and Canada was 1.37 (6.3 : 4.6). Relative recovery rates were 1.14 for teal banded in the United States and Canada and recovered in the United States; 1.38 for teal banded in Canada and Alaska and recovered in the United States; 1.06 for teal banded and recovered in the United States; 5.40 for teal banded in Alaska and Canada and recovered in Canada. Relative recovery rates were very high for bandings in the Prairie Provinces, particularly Alberta and Saskatchewan (28.3), about 4.0 for Alaska and 2.6 for Quebec and Lake Ontario bandings.

The discussion on the chronology of migration suggested that these variations in relative recovery rate are, at least partially, the result of the availability of the birds of a certain age group at a given place

and time. The lack of wariness of the immatures early in migration in the northern areas may also be a factor which decreases in importance as the birds gain experience during their southward trip.

Variations in Recovery Rates Associated with Sex

Direct recovery rates, by sex, for immatures and adults are shown in table 22. Adult males appeared to have higher recovery rates than adult females among greenwings banded in the Imperial and Central Valleys of California, in Manitoba and southeastern Saskatchewan. Recovery rates were similar for the two sexes banded in other areas. No single area showed a statistically significant difference between the recovery rates of the sexes, but the general tendency was towards a higher recovery rate for males. If each area was given equal weight, the average direct recovery rate of adult males was 4.8 percent and that of females was 3.9 percent, giving a male:female relative recovery rate of 1.23 ($4.8 \div 3.9$). The relative recovery rate was 1.27 for birds recovered only in the United States. For immatures, the recovery rate of males was higher than that of females in seven reference areas, and lower in eight reference areas, showing no clear difference. There were wide variations in the relative recovery rate of immatures in different harvest areas. The unweighted average male:female relative recovery rate for immatures was 1.5 for birds recovered in Canada and 0.9 for those recovered in the United States.

For birds banded in winter (table 23), males seemed more likely to be shot than females, except in the Puget Sound area. For teal banded in spring (table 24), higher recovery rates were indicated for males than for females in all banding areas and spans of years except in Louisiana and southern Texas during the early years. The unweighted average direct recovery rate from all banding areas for the period 1946 to 1961 gave a relative recovery rate of 1.2 (males/females) from winter bandings and 1.7 for birds banded in spring. (If the mortality occurring between banding and the first hunting season differs for the sexes, recovery rates from winter and spring banding do not give a good comparison of vulnerability to shooting between the sexes.)

Adult females, like immatures, were harvested in greater proportions than adult males in the northern portion of their migration routes and vice versa (tables A-2, A-7 and A-10). It follows that the male:female relative recovery rate of adults varies by area of recovery. Even though samples of adult females were inadequate to measure the relative recovery rate for each harvest area, the ratio of males to females would undoubtedly be lower in Canada and higher in Southern United States. Combined banding data from the Prairie Provinces showed a direct recovery rate in Canada of 0.013 for males and 0.140 for females suggesting that adult females were about 10 times more likely than males to be shot in Canada. This difference is probably due to the time of migration since adult males leave Canada before females but there is also a possibility that the behavior of males in Canada makes them less vulnerable to hunting.

Variations in Recovery Rates Associated with Time Periods and Hunting Regulations

Recovery rates, as indexes to the percent of the population harvested, can be expected to vary from year to year as a result of changes in hunting pressure. Banded samples of green-winged teal were too small to show annual differences, but when there were sufficient pre-season bandings in two or more periods having different hunting regulations, a comparison was made between the changes in recovery rates and in regulations to test for correlation (table 27). For teal banded in the United States, the flyway of banding determined the regulations to be compared with the recovery rates. For Canadian bandings, the regulations of the United States flyway over which most of the ducks migrated were used. Thus Quebec was associated with the Atlantic Flyway, Manitoba and southeastern Saskatchewan with the Mississippi Flyway, the Saskatchewan-northern Alberta reference area with the Central Flyway, and all banding areas west of Saskatchewan with the Pacific Flyway.

In 20 comparisons made, recovery rates increased or decreased 16 times in direct relation with increases or decreases in the "liberalness" of hunting regulations. The probability that this degree of agreement was due to chance is less than 0.001 ("Sign Test": Snedecor, 1961). The agreement between changes in recovery rates and changes in hunting regulations was complete for both immatures and adults banded east of the Continental Divide. In each of the three eastern flyways, the recovery rates reached a peak in the period 1952-58 when regulations were most liberal, and dropped sharply in 1959-61 when regulations were restrictive. The absence of correlation in the Pacific Flyway is probably due to the lack of major changes in regulations. Hunting seasons there were consistently long and bag limits were high and changed only slightly. Since the recovery rate is an index of the percent of a population taken by hunting, it can be concluded that the proportion of green-winged teal harvested in the three eastern flyways has been influenced by hunting regulations. Changes of regulations in the Pacific Flyway have been too minor to verify the phenomenon in that important harvest area.

No such correlation was evident with recovery rates of winter and spring bandings because most such banding was conducted in the Pacific Flyway. Furthermore, very low first-year recovery rates from winter and spring bandings require large samples of banded birds to allow the detection of differences (samples were small) and variations in non-hunting mortality occurring during the 4-7 months between banding and the hunting season could obscure this relationship.

Estimated Rate of Hunting Kill

What average fraction of the continental green-winged teal population is removed annually by hunting? To estimate the rate of hunting kill, the recovery rate must be adjusted for: (1) band-reporting rate and (2) rate of crippling loss.

The estimated band-reporting rate for green-winged teal was 43.4 percent during 1954-60 (Martinson, 1966a). Early estimates of crippling loss, based on reports from hunters, were about 25 percent of the retrieved kill, but recent field observations suggested a rate of crippling loss for all duck species, 1961-63, of about 50 percent in the three western flyways and 38 percent in the Atlantic Flyway (Carney and Smart, 1964).

Thus the kill rate may be obtained by multiplying the direct recovery rate by 3.4* for the Pacific, Central and Mississippi Flyways and 3.2 for the Atlantic Flyway. Kill rates of green-winged teal by harvest area, for birds banded in the summers of 1946-61, are shown in table 28. Band-reporting rates and crippling loss in Canada and Mexico were assumed to be similar to those in the United States.

Canadian and Alaskan bandings suggest a fairly consistent pattern. Green-winged teal banded in the Maritimes and Quebec were killed at about the same rate in Canada and the United States, about 22 percent of the immatures and 10 percent of the adults being shot. Birds banded near Lake Ontario were shot at the same rate as those banded in Manitoba, but a lesser portion was taken in Canada than in the United States. Only 7 to 11 percent of the teal banded in Saskatchewan and Alberta were shot, immatures at about the same rate as adults, and the kill was mostly in the United States (99 percent of the adult and 85 percent of the immature kill). The kill rate of green-winged teal banded in Central British Columbia was about 20 percent for both immatures and adults, and was completely in the United States. Recoveries of Alaska bandings indicated that about 21 percent of the immatures were shot (81 percent in the United States), and 10 percent of the adults (92 percent in the United States). The average unweighted kill rate of immatures banded in Canada and Alaska was 19.2 percent and that of adults 11.0 percent, with about 25 percent of the immature kill and 10 percent of the adult kill in Canada.

Among green-winged teal banded in the United States, the average kill rate of immatures was similar to that for Canadian bandings, but the kill rate of adults was much higher. Greenwings banded in Minnesota had an estimated kill rate of 25 percent for both age groups. The birds banded in the Central Flyway had a lower kill rate, but it was higher than that of birds banded in Saskatchewan and Alberta.

The highest kill rate was in the Puget Sound area (which includes Oregon and Washington), and in California. The band-reporting rate in these States may be higher than in other areas because hunters are often

* $\frac{100}{43} \left[\begin{array}{l} \text{conversion of} \\ \text{reporting rate} \end{array} \right] \times \frac{1.5}{1.0} \left[\begin{array}{l} \text{conversion of} \\ \text{crippling loss} \end{array} \right]$

concentrated in controlled public hunting areas and are frequently in contact with conservation agency employees. In California and Oregon, between 40 and 50 percent of the reported green-winged teal bands were sent in by conservation agency employees during the period 1957-61 (table 29). Everywhere else, about 15 percent of the bands were reported by this group. This may have biased the estimated kill rate in the Pacific Flyway by exaggerating it in comparison to other areas and, since the greatest amount of banding was in that flyway, it may have inflated the average kill rate estimate for birds banded in the United States. If bandings in the Puget Sound area and California are excluded, hunting mortality of immature teal banded in the United States falls within the limit found for immatures banded in Canada and Alaska (between 8 and 20 percent), although it is still somewhat higher for adults.

A precise rate of kill for the green-winged teal population on this continent is not possible because the banding data did not adequately represent the entire population and the relative size of the population segments represented by bandings in Canada and the United States is unknown. However, the existing data suggest a rate of hunting kill for North American green-winged teal of 15 to 20 percent during the period 1946-61. This hunting mortality is intermediate between those reported for mallards (41 percent) and for blue-winged teal (9 percent) banded in Illinois (Bellrose and Chase, 1950).

Most of the hunting kill was in the United States. In Canada, the green-winged teal kill west of Manitoba was light, only a fraction of 1 percent. In Manitoba, about 7 percent of the immatures and few of the adults were shot. In the Maritime Provinces and Quebec, about 10 percent of the immatures and 5 percent of the adults were shot in Canada. The total kill rate in Mexico was probably less than 1 percent.

MORTALITY RATES

Annual rate of mortality is a major factor in the population dynamics of a species. Mortality rate estimates for members of the Anatidae have been published by several authors (Hickey, 1952; Bellrose and Chase, 1950; Geis, 1959; Lemieux and Moisan, 1959). Boyd (1957) reported on the mortality rate of European green-winged teal banded in Britain and compared it with that obtained for the North American greenwing banded in Utah (Van den Akker and Wilson, 1949).

Banding data provide the best present means for estimating this parameter for the green-winged teal. Mortality rates for adult green-winged teal were obtained from recoveries of birds banded as adults and second and later year recoveries of birds banded as immatures. Mortality rates for immatures were calculated from the first-year portion of life tables of recoveries from greenwings banded as locals, juveniles and

immatures. These mortality rates measure the mortality occurring from the beginning of one hunting season until the start of the next and are summarized in tables 30 and 31. Most mortality rates are based on small numbers of recoveries (only 10 rates were calculated from 50 or more recoveries). Consequently, individual rates are subject to considerable variation from sampling error but an understanding of average annual mortality in green-winged teal can be gained from a consideration of all the data presented.

Variations in Mortality Rates Associated with Areas and Seasons of Banding

Average annual mortality rates were calculated for green-winged teal banded as immatures and locals in the summer and later recovered the same year as immatures or in later years as adults. These mortality rates ranged from 50 to 72 percent, and a certain pattern is evident. For birds banded from Manitoba to the Maritime Provinces, mortality rates averaged 67.3 percent. For Minnesota, Montana, Saskatchewan and Alberta birds, it averaged 55.7 percent. Alberta birds had a mortality rate of 50 percent; the lowest of the group. Greenwings banded in the Pacific Flyway and British Columbia had mortality rates in a range from 60 to 69 percent. The continental unweighted average annual mortality rate for green-winged teal banded as young-of-the-year was 62.8 percent.

Green-winged teal banded between January 15 and March 1 in the Pacific Flyway, in the Atlantic Flyway, and in the South-Central States had mortality rates varying between 57.5 and 60.3 percent, except for those banded in the Puget Sound area which had a mortality rate of 48.4 percent (table 30). All spring banding was done in the three western flyways and the average mortality rate of these adults was 56.8 percent. No clear pattern appeared in the variations among areas; birds banded in Puget Sound area, central California and in Oklahoma-northern Texas had lower than average mortality rates while those from the Imperial Valley, Nevada, interior Oregon, Kansas and Missouri had higher than average rates. Missouri-banded birds had the highest mortality rate, 63.6 percent.

Banding was not done in all areas during the same period of years, and mortality rates varied during different periods in the same area. Winter and spring bandings were not conducted long enough in the same area to allow comparisons between spans of years, but some summer banding was (table 32). The first-year mortality rate of immatures banded in Minnesota was 80.7 percent during 1955-58 and 63.9 percent in 1959-61. Similar changes existed for Saskatchewan and Alberta birds, but the variations were far less marked in the Pacific Flyway where the hunting kill and regulations were more stable.

Variations in Mortality Rates Associated with Age

Annual rates of mortality in ducks are usually higher during their first year of life than in later years (Hickey, 1952; Geis, 1959). However, Boyd (1957) did not find any difference in the mortality rate between immatures and adults, but his banding was done close to the wintering grounds and also he recognized that the small sample may have contributed to this apparent anomaly. The present data suggested that the annual mortality rate of green-winged teal banded as immatures was generally much higher during their first year of life than in later years. Exceptions were in the Saskatchewan-northern Alberta reference area and in the Imperial Valley where annual survival of immatures and adults appeared to be similar (table 31), and in the Salt Lake Valley area where the first-year mortality rate of immatures was lower than that of adults. The mortality rate of teal banded as adults during the summer ranged from 47 percent for Alberta bandings to 70.9 percent for Imperial Valley bandings, with a mean of 58.5 percent. This is higher than the average annual mortality rate for adults calculated from second and later year recoveries of birds banded as immatures, 50.1 percent. The difference might be because some immatures were classified as adults in the banded samples. Or, more likely, the size and distribution of bandings of immatures was better and may have resulted in a more accurate and representative estimate of the mortality rate. Green-winged teal banded in winter and spring had mortality rates ranging from 48.4 to 63.6 percent with an average of 56.6 percent.

Variations in Mortality Rates Associated with Sex

Female canvasbacks, black ducks and mallards have higher mortality rates than the males of those species (Geis, 1959; Smith and Geis, 1966; Martinson, 1966b). Because band recovery rates for females are similar to those for males (in mallards the males generally have the higher recovery rate), this is probably the result of higher nonhunting mortality for the females. Not enough adult green-winged teal were banded in the summer to measure such a difference in mortality rates. In the two summer reference areas with sufficient samples of adults, the Saskatchewan-northern Alberta and the Salt Lake Valley areas, mortality rates for males and females varied from 50 to 53 percent. From winter and spring banding, the estimated mortality rate of females was higher than that of males in the Puget Sound and Imperial Valley samples, equal to that of males in the Central Valley sample, and lower in the Kansas and interior Oregon spring samples (table 30).

No greater mortality for females was shown among the birds banded as immatures (table 31). The first-year mortality rate of immatures was higher for females from three reference areas (Alberta, Puget Sound and Imperial Valley), and lower in five reference areas. The average

first-year rate was 69.7 percent for females and 68.7 for males. In their later years of life, mortality rates of males were higher than that of females in four reference areas and lower in four areas.

When all data on mortality rates for males and females are considered, males had lower rates in 9 of 17 comparisons and the unweighted average mortality rates were 54.6 percent for males and 53.6 percent for females. However, when rates are calculated only for samples with 50 or more recoveries, a tendency for higher mortality rates among females is suggested. These mortality rates were from winter bandings in the Central and Imperial Valleys; spring bandings in the Imperial Valley and Puget Sound; summer bandings of immatures from Baie Johan Beetz, Minnesota, and Puget Sound (adult recoveries); and summer bandings of adults in the Saskatchewan-northern Alberta reference area (tables 30 and 31). Average annual mortality rates for females were higher in 5 of 8 of these comparisons and the unweighted average mortality rates were 49.3 for males and 55.7 for females. Boyd (1957) reported a mean annual rate of 57 percent for females and 49 percent for males in eastern England, but his Pembrokeshire sample showed contrary results, which he could not explain.

Variations in Mortality Rates Associated with Recovery Rates

Hunting is a significant cause of mortality in most species of waterfowl. For green-winged teal different degrees of shooting pressure will result in corresponding differences in rate of harvest.

The next question to answer is: Will an increase in rate of kill cause a reduction in survival, or be compensated by a lower rate of natural (nonhunting) mortality? In general, high survival seemed to occur where the recovery rate was low. The relation between mortality rates and recovery rates of green-winged teal is shown in figures 11 and 12. These data are average first-year mortality rates for immatures, average annual mortality rates for adults and first-year recovery rates (both age groups) for each reference area and span of years which had 20 or more recoveries from preseason bandings (table 32). There appears to be a correlation between band recovery rates and mortality rates for both adults and immatures. For adults, this correlation is highly significant ($r = 0.76$, $p = >0.99$). For immatures, the correlation is not as strong but is still highly significant ($r = 0.57$, $p = >0.99$). Results of chi-square test suggested that linear regression was adequate to describe the concomitant variation of the two variables. The difference between the two correlation coefficients is significant ($t = 15.85$, d.f. 28) suggesting that the rate of hunting kill has influenced the survival of adults most significantly (although immatures are more vulnerable to

shooting than are adults, they are also more vulnerable to nonhunting mortality -- figure 12 shows that in the absence of shooting, the intercept of the regression line, immatures will still be subject to a high rate of annual mortality).

For winter and spring bandings, the relation between recovery and mortality rates was not significant. Small banded samples and relatively high nonhunting mortality between the time of banding and the hunting season were probably responsible for this apparent lack of relationship.

In brief, data from preseason bandings suggest that the kill rate of green-winged teal has influenced its annual mortality rate. Since hunting regulations, through hunting pressure, have influenced the kill rate, it follows that regulations influenced the mortality rate of this species.

Mortality Due to Hunting

Hickey (1952) used the regression of recovery rate and mortality rate to determine the relative importance of hunting mortality compared to mortality from other causes. Figures 11 and 12 reveal that, if the recovery rate equals zero (no hunting mortality), the mortality rate of immatures from other causes will vary from 53 to 71 percent ($p = 0.95$) and average 62 percent. Nonhunting mortality of adults would be between 36 and 52 percent and average 44.4 percent. If natural or nonhunting mortality rate is independent of hunting mortality, the distance between a line parallel to the abscissa (intersecting the regression line at recovery rate = 0) and the regression line will represent the mortality due to hunting. (Hickey recognized that nonhunting mortality probably does not possess that inflexibility.)

Another method to reach the same objective consists of subtracting the estimated kill rate (hunting mortality) from the total annual mortality rate for a given recovery rate (A. D. Geis, pers. comm.). The kill rate was calculated for each recovery rate and subtracted from the total mortality rate on the regression line. This procedure resulted in a line showing the natural mortality (figs. 13 and 14). In figure 14, a recovery rate of 6 percent would mean an estimated hunting mortality rate of 20 percent ($6 \times 3.3^*$), a total annual mortality rate of 61.4 percent (from regression line) and consequently, a nonhunting mortality rate of 41.4 percent.

For immatures (fig. 13), nonhunting mortality was high and hunting mortality appeared to have replaced a large part of it. When there was no hunting mortality (recovery rate = 0), the rate of nonhunting mortality

*The average kill rate conversion factor explained on p. 28.

was 62 percent. With a recovery rate of 6 percent, hunting mortality was 20 percent and total mortality had been increased to 71.4 percent. This resulted in a nonhunting mortality rate of 51 percent compared to a corresponding rate of 41 percent for adults subjected to the same shooting pressure. As the kill rate increased, the fraction of non-hunting mortality which was replaced by hunting mortality also increased.

Adults show a different pattern (fig. 14). It appears that hunting mortality was almost completely added to nonhunting mortality. The nonhunting mortality rate, estimated at 44.4 percent with no hunting kill (recovery rate of 0), was still 41.4 percent when the kill rate equalled 20 percent (recovery rate of 6.1 percent).

In summary, the mortality rate of green-winged teal banded during summer averaged 70 percent for immatures and 50 percent for adults. It was about equally high for birds banded on the east and west coasts of the continent, but lower for birds banded in the Prairie Provinces, especially Saskatchewan and Alberta. Little difference in mortality rates between males and females was detected, but this may have been due to small banded samples. A strong correlation was found to exist between recovery rate and mortality rate indicating that the mortality rate was influenced by the rate of kill. It appeared that hunting mortality was largely additive to natural mortality for adult green-winged teal but, for immatures, hunting mortality partially replaced natural mortality.

AGE RATIOS AND PRODUCTION RATES

The age ratio reflects the productivity of a population and, with mortality rate, can be used to evaluate the status of the population. Its practical value and interpretation in North American ducks have been reviewed by Bellrose et al. (1961). This section will discuss age ratios of green-winged teal ascertained by various methods, regional and seasonal variations in age ratios, estimates of the age ratio in the population and a comparison of the production rate with mortality rate.

Age Ratios in the Harvest

Age ratios (immature:adult) of green-winged teal in the harvest, from wing collection surveys, are in table 33. Flyway and United States ratios were the average of age ratios for States weighted in proportion to the size of the harvest in the States.

Regional and Yearly Variations in Age Ratios

The age ratio in the total harvest decreased from 1961 to 1962 but increased in 1963. Age ratios were generally lower in the Pacific Flyway than in other flyways. Age ratios were higher in the Mississippi Flyway

than in the Central and Atlantic Flyways in 1961 and 1962 but lower in 1963. Age ratios were generally higher in Northern than in Southern States.

Even though age ratios of trapped ducks may not represent the population or be comparable from area to area because of different trapping techniques, they can show broad trends in time and place (table 34). Data for birds known to have been trapped in drives of molting areas were excluded. A trend in age ratios similar to that shown by the wing data is indicated; that is, higher age ratios in northern areas, particularly in Canada, than in southern areas.

Bag check reports, submitted to the Canadian Wildlife Service between 1950 and 1960 by R. H. MacKay for British Columbia, N. G. Perret for Manitoba, L. Lemieux and G. Moisan for Quebec, and G. F. Boyer and B. C. Carter for the Maritimes, provide more age ratio data. The average age ratio of green-winged teal in the bag in that period was 4.3 in British Columbia (3,270 birds), 5.6 in Manitoba (330 birds), 4.3 in Quebec (212 birds) and 2.0 in the Maritimes (445 birds).

The data on age ratios of green-winged teal tend to reflect the phenomenon suggested in the banding data. Namely, the relative vulnerability of immatures to adults was higher in Canada and the Northern States than in Southern States; lower in the Pacific Flyway than in the other flyways (tables 21 and 24).

Seasonal Variations in Age Ratios

Age ratios by monthly periods for 1961 and 1962 hunting seasons are in table 35. These data indicate a certain chronological trend, especially in the Pacific Flyway where the hunting seasons were long and a large number of wings was received.

In the Northwestern States, which are the wintering grounds for Alaskan and Yukon birds, the age ratio was high in October and tapered off in succeeding months. In Utah, a low age ratio was interpreted by Bellrose et al. (1961:443) as representing a pronounced movement of immatures before the hunting season. The present data show an age ratio in trapped samples in Utah before the hunting season of 0.5 immatures per adult, and 64 percent of the direct recoveries (14) from immatures summer-banded in Utah were reported from there in October and November. Age ratios in California were less than 1.0 in early October; increased to 1.0 in the last week of October 1961 and 1.2 in the first week of November 1962; and decreased again to less than 1.0 later in November. This suggests that a wave of immatures passed through California, probably via Utah, in late October and early November and thus were available to

hunters for only a short time. These data suggest also that more immatures than adults migrate beyond the United States to winter in Mexico. A similar hypothesis was derived from banding data.

In November 1962, age ratios were strikingly low in Delaware, New Jersey, Virginia, and North Carolina compared to the age ratio in Florida. In the Atlantic Flyway, most green-winged teal are killed in November in the States named suggesting that immatures tend to move rapidly through these States until they reach their wintering grounds in South Carolina and Florida.

Seasonal variations in the age ratio of trapped teal (table 34) tend to confirm the early movement of adults out of the northern areas, particularly from Manitoba, northern Alberta and the Mackenzie District. The age ratio in Quebec and Newfoundland was always high for immatures and observed changes did not reveal any clear trend.

Estimate of Productivity

The literature on the productivity of green-winged teal is scarce. Bellrose et al. (1961), using hunter bag-check data from Illinois during 1946-47, classified the production rate intermediate between the rates of the mallard and black duck (high) and those of the pintail and blue-winged teal (low). In Illinois, the number of young per adult hen (corrected for differential vulnerability) was 3.7 for green-winged teal, 4.2 for mallards and 3.2 for pintails.

Average clutch sizes for green-winged teal have been reported as: 10-12 in North America (Bent, 1925), 7.5 in western Montana (Girard, 1941), 6-9 in British Columbia (Munro, 1949). Hatching success was 75 percent in western Montana (Girard, 1941). In southeastern Alberta, Keith (1961) found only 25 percent hatching success but renesting was common since each hen on his study area laid 1.4 clutches.

Brood sizes were: 5.6 in Montana (class I; Girard, 1941), 5.6 in New Brunswick (class III; Wright, 1954), 6.0 in Quebec (class III; Reed, 1963), 6.9 in Alaska (all size classes; Waterfowl Status Reports, 1958-63). Thus the brood size for green-winged teal probably varies from 5 to 7 at fledging.

Age ratios of green-winged teal in the harvest varied between States and flyways and between years in the same region. There were probably also annual variations in the relative vulnerability of immatures and adults to hunting. Since the banding data represent a different period (1946-61) than the age ratios (1960-63) and because there were never adequate samples banded annually, it is difficult to appraise the productivity of the green-winged teal. However, we made estimates of the productivity or age ratio in the population during 1961-63 in the following

manner. The mean immature:adult relative recovery rate was 1.14 (p. 25) for all green-winged teal banded during the summer and preseason period, 1946-61, and recovered in the United States (because the age ratio was measured in the United States harvest, the relative recovery rate must also be measured from recoveries only in the United States). By dividing the age ratios in the harvest by this average relative recovery rate, we approximated the age composition of the 1961-63 fall populations of green-winged teal as: 1.6 immatures per adult in 1961 ($1.84 \div 1.14$), 1.2 in 1962 and 1.7 in 1963.

Productivity Versus Mortality

Is the annual production of green-winged teal adequate to maintain a stable population? The average annual mortality rate for all green-winged teal banded as immatures in the United States and Canada during the period 1946-61 was 62.8 percent. To maintain a stable population with this annual rate of loss, the annual rate of increase measured just prior to the hunting season must be 63 percent. In other words, the average age ratio must be 1.7 immatures per adult.

Our rough approximations of the age ratio were 1.6 in 1961, 1.2 in 1962, and 1.7 in 1963. Only in 1963 did the age ratio equal 1.7. However, it should not be concluded that the green-winged teal population was being depleted or that the mortality rates are in error because, even if our rough estimates are accurate, the period 1961-63 was one of presumably poor production and it is probable that the stringent hunting regulations enforced during that period resulted in lower than average mortality. If the mortality rate during 1961-63 was less than the average for 1946-61, the age ratio necessary to sustain a stable population would be lower than 1.7.

SEX RATIOS

Bellrose et al. (1961) reported sex ratios in North American ducks, but their work contained little information on green-winged teal. Data in this report were obtained from the wing collections, hunter-bag checks, live-trapped ducks, and sight observations.

Regional Variations in Sex Ratios

Since sex ratios of adult and immature segments of a population differ, they warrant separate treatment. Following the classification of Mayr (1939) and Bellrose et al. (1961), quaternary sex ratio (adult) and tertiary sex ratio (immature) are discussed.

Quaternary Sex Ratio

There seems to be a marked preponderance of male green-winged teal in the harvest of adults in the Pacific and Central Flyways (table 36). In the Mississippi and Atlantic Flyways, sex ratios of adults in the harvest do not deviate as far from 50:50. Within flyways, male:female sex ratios were generally higher in the south because of the tendency for females to be taken in the north and males to be taken in the south. Some exceptions resulted; probably from local differences in the seasonal movements of males and females. Males were everywhere preponderant in the harvest in the Central Flyway, even in North and South Dakota. Males constituted a surprisingly high percentage of the harvest in Illinois and the sex ratio in the kill in Florida was lower than expected.

The number of adult green-winged teal among wing collections in Ontario, Quebec and Prince Edward Island was not sufficient to draw conclusions. Drakes made up 24 percent of 58 adult green-winged teal in hunters bags in Manitoba, 1946-49 (Bellrose et al. 1961:404). The adult male:female ratio in bag-check data between 1950 and 1960 was 0.7 in British Columbia (619 birds) and 0.6 in the Maritime Provinces (151 birds).

Tertiary Sex Ratio

Sex ratios of immature birds in the United States harvest are recorded in table 37. As in the harvest of adults, male:female ratios were higher in the south. This regional variation was surprising because in most studies immatures have been treated as a group on the assumption that there is no differential migration related to sex. In the Pacific Flyway, the ratio of males to females averaged about 0.65 in the harvest of immatures. In the Central and Mississippi Flyways, the sex ratio was about even. In the Atlantic Flyway, the average sex ratio in the harvest of immatures was about 0.8 males per female and appeared to be highest in the Mid-Atlantic region but the trend in sex ratio from north to south was less than for other flyways. In Canada, fragmentary wing collection data are available: (1) on Prince Edward Island in 1961, 70 percent of 96 immature green-winged teal were females, (2) in Ontario in 1962, 60 percent of 25 immature teal were females. Bag checks between 1950 and 1960 showed an even sex ratio in Manitoba (280 birds), Quebec (166 birds) and the Maritimes (297 birds), but in British Columbia, 62 percent of 2,650 immature green-winged teal were females.

Sex ratios in the harvest in the Pacific Flyway and the relative recovery rate of immatures banded in Alaska, Salt Lake Valley, Central Valley, and Imperial Valley favored females. The relative recovery rate for immatures recovered in Canada favored males (table 38). This warrants study to learn if sexual segregation occurs in flocks of immature green-winged teal. Flocking behavior might explain the wide regional variations in the sex ratio of immatures and such things as the high male:female

relative recovery rate of immatures banded in eastern Canada and recovered in the Atlantic Flyway when the sex ratio in the Atlantic Flyway harvest favors females.

Monthly Variations in Sex Ratios

Because of the short hunting seasons in 1961, 1962, and 1963, monthly variations in the sex ratio were not very revealing, except in the Pacific Flyway (table 38). In Washington and Oregon, the adult sex ratio favored females in October, but tended to even out in early winter. In Utah, the percentage of males increased from October to December. In California, where the season was long and about 30 percent of the United States harvest of green-winged teal was taken, the trend in the adult sex ratio by 10-day periods was as follows:

		1961	1962	1963
October	11-20	2.0	2.5	--
	21-31	3.4	3.3	3.9
November	1-10	1.5	1.1	2.9
	11-20	3.2	2.8	1.8
	21-31	--	--	2.0
December	1-10	4.7	3.2	2.5
	11-20	2.7	1.9	2.7
	21-31	3.1	2.1	3.3
January	1-10	3.1	2.1	3.3

The percentage of males was highest in October and December and was lowest in the first or second third of November, suggesting a passage of adult females. Evidently groups of immatures (section on Age Ratios) and adult females pass through California at that time, probably on the way to Mexico. This would explain the low vulnerability in California of immatures and adult females compared to that of adult males.

Monthly variations in the tertiary sex ratio in the Pacific Flyway harvest (table 39) were slight and females predominated. In the Mississippi and Central Flyways, the sex ratios in the harvest were generally even or favored females early in the season in the north. Later in the season in the south, more males than females were taken. In the Atlantic Flyway, females generally predominated early in the season in the Northeastern States. In November, males exceeded females in number in the Mid-Atlantic States. Late in the season in Florida the sex ratio was more even.

Seasonal Variations in Sex Ratios

The sex ratio of trapped adult green-winged teal at different periods of the year and in various locations from 1948 to 1961 is in table 40. These data help confirm: (1) the early departure of adult males from the breeding grounds and their flight to British Columbia, Utah, California, the Dakotas, and Nebraska; (2) the passage of adult females through California in late October or in November; (3) the predominance of males among green-winged teal wintering in the Mid-Atlantic States, in the coastal marshes of the Gulf of Mexico, and in California; and (4) the nearly even sex ratio in coastal Oregon and the Puget Sound. In addition, spring banding records suggest that males and females follow a different sequence in their northward migration.

Sex ratios of immature greenwings trapped during the summer differed only a little from a 50:50 ratio, except in Puget Sound, Utah, and California (table 41). Since these areas are not significant breeding grounds for green-winged teal, it appears that there was an early southward movement of immature males during August and September in the Pacific Flyway. However, there was no evidence of this sort of movement out of the Prairie Provinces. Females predominated in the traps in Quebec and the Maritimes in October but the reverse was apparent in Manitoba and Minnesota. In California, females predominated in fall trap catches as they did in the harvest there.

From sight observations, Beer (1945) did not find significant departure from a 50:50 ratio between November and late April in southwestern Washington. Johnsgard and Buss (1956), in the pothole region of Washington, reported a sex ratio of 123 males:100 females from January 15 to March 28; 112:100 in April and the first part of May. Field observations in the spring and winter in British Columbia (Munro, 1949) provided no evidence of sexual segregation in migration, as sometimes found in the pintail there. Lebret (1950) found that from November to March, adult males of European green-winged teal predominated in the Netherlands and females predominated in the southern parts of the winter quarters. Then in March and April, the sexes became proportionately more equal in the Netherlands. This situation is very similar to that in North America where males predominated in the Mid-Atlantic States, the gulf coast marshes, and California, while we presumed that females predominated in Mexico. The biological significance of the different migrational movements suggested by Lebret (1947, 1950) is the protection of females which are more affected by severe weather than males. It is doubtful that this hypothesis can be completely verified in North America when a population with an even sex ratio winters in coastal Oregon, Washington, and British Columbia.

Sex Ratios in the Green-winged Teal Population

Although the data are inadequate, as explained in the section on Age Ratio, estimates of sex ratios in the green-winged teal population were made as follows. The weighted sex ratios of adult green-winged teal shot in the United States in 1961, 1962 and 1963 were 1.56, 1.48 and 1.67 males per female, respectively. The average male:female relative recovery rate for adults in the United States, 1946-61, was 1.27 (p. 26). Assuming that this average relative recovery rate could be used for 1961-63, the sex ratio in the adult population at the time of banding was 1.2 males per female in 1961 ($1.54 \div 1.27$), 1.2 in 1962 and 1.3 in 1963. Although crude, calculations suggest that the "excess drake" phenomenon mentioned throughout the literature applies also to the green-winged teal.

The weighted average sex ratios (males per female) of immature green-winged teal in the United States harvest were 0.72 in 1961, 0.84 in 1962 and 0.94 in 1963. The unweighted average male:female relative recovery rate of immatures banded in the United States and Canada and recovered in the United States was 0.9 (p. 26). Thus the calculated sex ratio of immatures at the time of banding was 0.8 males per female in 1961 ($0.72/0.9$), 0.9 in 1962 and 1.0 in 1963. After studying about 12 species of ducks, Bellrose et al. (1961) concluded that the tertiary sex ratio was close to 50:50 and that local variations were caused by differences in seasonal movements.

ESTIMATES OF POPULATION SIZE

Two estimates were made of the size of the North American green-winged teal population. One was made from data obtained by wing collection and questionnaire surveys coupled with preseason banding data. The other was made with data from the aerial breeding population survey.

Estimate from Harvest and Banding Data

This method requires a knowledge of the harvest of adult and immature green-winged teal and the rate of harvest of both age groups. The procedure to obtain this indirect estimate of population size was described by Carney and Geis (1960) and Smith and Geis (1961).

The annual harvest of green-winged teal in the United States averaged 850,000 birds, 1955-63. From indirect band recoveries, and assuming an age ratio in the Canadian harvest of 4.0, the total harvest in Canada was estimated at 150,000 birds. The harvest in Mexico was

ignored since banding data suggested only 10,000 to 15,000 birds taken annually. Hence, the mean annual harvest of green-winged teal in the United States and Canada was 1,000,000.

The average age ratio of green-winged teal in the United States harvest, 1961-63, was 1.70. Including the Canadian harvest, the average age ratio was 1.90 (an assumed age ratio of 4.00 among 150,000 birds bagged in Canada plus an age ratio of 1.70 for 850,000 in the United States). With an age ratio of 1.90, the harvest would be comprised of 345,000 adults and 655,000 immatures.

The unweighted average direct band recovery rate from preseason bandings was 4.6 percent for adults and 6.3 percent for immatures, 1946-61. The resulting immature:adult relative recovery rate was 1.36. When the recovery rates are adjusted for bands recovered but not reported, using 43.4 percent as the band-reporting rate, the rate of harvest is 10.6 percent for adults and 14.5 for immatures.

The preseason population estimates obtained by dividing the harvest by the rate of harvest were 3,255,000 adults and 4,517,000 immatures for a total of 7,772,000 green-winged teal. The age ratio in this average prehunting-season population is 1.39 immatures per adult.

Estimates from Breeding Population Survey

Average aerial indexes (1956-63) of green-winged teal for the various ecological zones are summarized in table 3. Only a fraction of the waterfowl are seen and recorded on aerial surveys. Comparisons of aerial and ground counts on study transects suggest that about 4 percent of the greenwings present in Alaska and 7 percent in the Prairie Provinces are recorded in the aerial indexes (unpublished data filed at the Migratory Bird Populations Station). Using these data with the aerial indexes (7 percent for grassland and parkland habitat and 4 percent for mixed and boreal forest and tundra), an estimate of the average breeding population of green-winged teal is 3,900,000. An additional number of birds breed in British Columbia, Washington, Oregon, Utah, California, Colorado, Nebraska, Montana, and the Maritime Provinces which are not surveyed annually. Considering numbers of birds in these areas, the population would be somewhat higher, perhaps 4,000,000. If the age ratio was close to 1.39 young per adult in the fall, the continental population would be about 9,500,000.

Both population estimates were based on rather weak data and each estimate, considered separately, could be discounted. However, both methods yield somewhat comparable results and thus we concluded that the average prehunting-season population of green-winged teal in North America, 1946-61, was between 7 and 10 million.

SUMMARY AND CONCLUSIONS

In this study, published information on green-winged teal was reviewed and data from banding and other surveys used to derive the distribution, migration, harvest characteristics and population dynamics of the species. Most topics were treated superficially because data were adequate to reveal only general patterns. However, some findings as well as gaps in our present knowledge about this species are worth summarizing.

The green-winged teal is widely distributed in North America. It breeds from Alaska to Newfoundland and winters on the Pacific, Atlantic and Gulf Coasts. Limited data permitted the definition of two fairly discrete populations in the Pacific Northwest and in eastern Canada and the Atlantic Flyway but, between them, we could only infer an interrelated complex of birds breeding from Alaska to Hudson Bay and wintering from California to Louisiana. No attempt was made to evaluate the relative numbers of birds which follow the various migration routes because the data required to measure the volume of movement were not available.

The green-winged teal ranks second or third among game ducks in the harvest in the Central and Mississippi Flyways, third or fourth in the Pacific Flyway and fifth or sixth in the Atlantic Flyway. During the last 10 years, about one million green-winged teal were harvested annually and the species was available to hunters of each Province and State on the continent. About 15 percent of the total harvest was taken in Canada, 1 or 2 percent in Mexico and the rest in the United States. In Canada, the greenwing was most important to hunters in the eastern Provinces, but harvest in the western Provinces, especially British Columbia, was two or three times greater. In the United States, about half of the harvest was taken in the Pacific Flyway, 10 percent in the Atlantic Flyway and the rest was about equally divided between the Central and the Mississippi Flyways. California alone was responsible for one-third of the United States harvest. Thus the Pacific Flyway, and particularly California, should be the focal point for special regulations needed in managing the harvest.

The possible role of the green-winged teal as a buffer species for other species could not be demonstrated. The species importance in the harvest did not seem related to the abundance of mallards or to changes in hunting regulations during the period 1960-63.

Harvest zones could not be associated accurately with particular breeding populations. However, banding data suggested that the greenwings taken in the Atlantic Flyway breed east of James Bay and Lake Michigan. The contribution of birds from the Prairie Provinces and the Northwest Territories to the Atlantic Flyway seemed small, but more winter banding in the Atlantic Flyway is needed to confirm this.

Between 15 and 20 percent of the prehunting season greenwing population was killed by hunters. The rate of kill was not uniform across the continent; it appeared to be lowest among birds banded in Alberta, Saskatchewan and the Central Flyway and highest for those banded in the Pacific Flyway. (However, kill rates for Pacific Flyway birds may have been exaggerated by a biased band-reporting rate.)

The green-winged teal appears to be quite susceptible to changes in hunting regulations. Season length and bag limit changes were shown to have affected the kill. However, the opening date probably had little effect on the kill because greenwings appear to arrive in most harvest areas before the hunting season opens and remain for most of the season.

The average annual mortality rate for the continental population of green-winged teal was 63 percent; 70 percent for immatures and 50 percent for adults. The mortality rate, especially that of adults, was directly related to rate of kill. Because the rate of kill was influenced indirectly by hunting regulations (through hunting pressure), hunting regulations have affected the survival of green-winged teal.

In conclusion, the following studies and banding are recommended to provide a better understanding of green-winged teal in North America.

1. A thorough study of the breeding biology of the green-winged teal in North America has not yet been conducted. Studies to supply basic data on behavior, productivity, and habitat requirements would have most value if done in Alaska, the Slave River parklands, northeastern Alberta, and in the eastern Canadian Provinces.
2. A study of flocking behavior of immature greenwings might explain the curious sex ratios found in the harvest and the varying differential vulnerability of immature males and females throughout the range.
3. Data should be gathered on species composition, and age and sex ratios in the Canadian and Mexican harvest to permit better estimates of the harvest and relative importance of the bird in those countries.
4. More "locals" should be banded to relate harvest areas and breeding grounds and to help understand migration routes.
5. More birds should be banded in northern Ontario and northern Manitoba on the west coasts of James and Hudson Bays to determine the importance of this breeding area to the Mississippi Flyway. Preseason banding in Michigan and northern Ohio might help provide the necessary data.

6. More winter banding is needed from Chesapeake Bay to Florida to confirm or reject the hypothesis that green-wings from the Prairie Provinces are not important in the Atlantic Flyway.
7. Winter banding in Mexico would help understand the migration pattern in the western flyways.

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Table 1.--Numbers of recoveries of green-winged teal banded in States and Provinces, 1914-61

State or Province of banding	Total banded	Total recovered	Percent recovered	Percent of total bandings	Span of years
<u>Canada and Alaska</u>					
Labrador	399	28	7.0	0.4	(47-54)
Newfoundland	1,399	93	6.6	1.3	(47-58)
Nova Scotia	35	10	28.6	T	(51-58)
New Brunswick	135	16	11.9	0.1	(42-61)
Prince Edward Island	13	4	30.8	T	(56-61)
Quebec	4,417	364	8.2	4.2	(31-61)
Ontario	757	46	6.1	0.7	(23-61)
Manitoba	2,214	182	8.2	2.1	(23-61)
Saskatchewan	15,233	688	4.5	14.3	(22-61)
Alberta	5,085	233	4.6	4.8	(28-61)
British Columbia	8,427	694	8.2	7.9	(24-59)
Mackenzie	592	30	5.1	0.6	(55-61)
Alaska	1,255	76	6.1	1.2	(21-61)
Total	39,961	2,464	6.2	37.6	
<u>Atlantic Flyway</u>					
Maine	54	6	11.1	T	(46-61)
Vermont	93	3	3.2	T	(47-60)
New Hampshire	22	2	9.1	T	(58-59)
Massachusetts	155	7	4.5	0.1	(31-61)
Connecticut	2	--	--	T	(50)
Rhode Island	--	--	--	--	--
New York	400	44	11.0	0.4	(23-61)
Pennsylvania	68	3	4.4	T	(57-61)
West Virginia	22	6	27.3	T	(53-60)
New Jersey	104	9	8.7	0.1	(54-59)
Delaware	54	3	5.6	T	(41-60)
Maryland	146	6	4.1	0.1	(45-60)
Virginia	194	14	7.2	0.2	(45-60)
North Carolina	479	30	6.3	0.5	(36-61)
South Carolina	33	2	6.1	T	(39-60)
Georgia	1	--	--	T	(61)
Florida	41	2	4.9	T	(36-60)
Total	1,868	137	7.3	1.8	

Table 1.--Numbers of recoveries of green-winged teal banded in States and Provinces, 1914-61--continued

State or Province of banding	Total banded	Total recovered	Percent recovered	Percent of total bandings	Span of years
<u>Mississippi Flyway</u>					
Minnesota	1,987	164	8.3	1.9	(35-61)
Wisconsin	436	60	13.8	0.4	(28-61)
Michigan	214	20	9.3	0.2	(29-61)
Iowa	80	2	2.5	T	(55-60)
Illinois	221	22	10.0	0.2	(31-61)
Indiana	55	9	16.4	T	(25-61)
Ohio	81	10	12.3	0.1	(30-61)
Missouri	1,839	95	5.2	1.7	(23-61)
Kentucky	2	--	--	T	(51-57)
Arkansas	203	10	4.9	0.2	(30-61)
Tennessee	49	8	16.3	T	(49-61)
Louisiana	1,930	96	5.0	1.8	(16-59)
Mississippi	8	--	--	T	(49-56)
Alabama	2	1	50.0	T	(47)
Total	7,107	497	7.0	6.7	
<u>Central Flyway</u>					
Montana	1,425	71	5.0	1.3	(27-61)
North Dakota	796	61	7.7	0.7	(31-60)
South Dakota	568	40	7.0	0.5	(33-61)
Wyoming	291	15	5.2	0.3	(39-58)
Nebraska	614	20	3.3	0.6	(27-61)
Colorado	1,393	34	2.4	1.3	(38-61)
Kansas	3,884	142	3.7	3.7	(25-61)
New Mexico	915	26	2.8	0.9	(29-61)
Oklahoma	2,017	115	5.7	1.9	(39-58)
Texas	1,600	54	3.4	1.5	(28-60)
Total	13,548	578	4.3	12.7	
<u>Pacific Flyway</u>					
Washington	4,160	459	11.0	3.9	(31-61)
Oregon	9,893	872	8.8	9.3	(26-61)
Idaho	893	40	4.5	0.8	(28-61)
California	24,171	1,667	6.9	22.7	(28-61)
Nevada	2,449	101	4.1	2.3	(49-61)
Utah	1,884	124	6.6	1.8	(14-61)
Arizona	477	16	3.4	0.4	(49-61)
Total	43,927	3,279	7.5	41.3	
Grand total	106,366	6,955	6.5		

Table 2.--Individuals and agencies that banded 200 or more green-winged teal before 1962

Permittee	Location	Period	Number banded
Salton Sea NWR	California	1948-61	17,219
Bear River Migratory Bird Refuge	Utah	1929-61	11,978
Ducks Unlimited	Prairies	1940-61	7,413
Malheur NWR	Oregon	1925-61	7,075
California Dept. of Fish & Game	California	1948-61	5,296
Floyd Thompson	Saskatchewan	1950-53	4,562
A. J. Butler	British Columbia	1934-39	3,418
Canadian Wildlife Service	Quebec	1950-60	3,416
G. C. Reifel	British Columbia	1932-35	3,105
Oregon State Game Commission	Oregon	1948-61	2,974
Washington Department of Game	Washington	1947-61	2,855
Preston F. Osborn	Kansas	1934-41	2,616
A. McIlhenny	Louisiana	1916-41	1,906
G. H. Culbertson (Mrs.)	Alberta	1954-58	1,883
Northeast Wildlife Station	Quebec & Maritimes	1947-61	1,590
Colorado Game, Fish & Parks Dept.	Colorado	1947-61	1,588
Nevada Fish & Game Commission	Nevada	1949-61	1,575
Salt Plains NWR	Oklahoma	1943-58	1,414
Montana Fish, Game & Parks Comm.	Montana	1949-60	1,319
A. L. Hager	British Columbia	1933-35	1,201
Rice Lake NWR	Minnesota	1958-61	1,179
Tule Lake NWR	California	1935-59	1,159
Squaw Creek NWR	Missouri	1936-61	1,082
Urban C. Nelson	Alaska	1948-61	1,078
McNary NWR	Washington	1956-61	1,066
F. W. Robl	Kansas	1925-61	1,065
Arthur Hawkins	Manitoba	1943-53	1,056
C. S. Williams	Prairies	1946-48	953
Utah Department of Fish & Game	Utah	1947-60	952
Ruby Lake NWR	Nevada	1947-60	951
W. Va. Dept. of Natural Resources	West Virginia	1954-60	825
Idaho Fish & Game Department	Idaho	1949-61	738
Des Lacs NWR	North Dakota	1936-60	696
Missouri Conservation Commission	Missouri	1952-60	600
Gordon True	California	1939-44	589
Edward Kroll	Ontario	1956-61	575
S. Hall	Newfoundland	1951	556
Gaston Moisan	Quebec	1961	555
Wesley Newcomb	Prairies	1956	530
Sand Lake NWR	South Dakota	1937-61	529
Hugh S. Davis	Oklahoma	1939-48	513

Table 2.--Individuals and agencies that banded 200 or more green-winged teal before 1962--continued

Permittee	Location	Period	Number banded
Nebr. Game, Forestation & Park Comm.	Nebraska	1949-61	494
H. R. Webster	Alberta & NWT	1953-58	490
W. Fuchs	Alberta	1961	455
Sacramento NWR	California	1937-60	443
Allen Smith	Alberta	1949-50	443
Delta Waterfowl Research Station	Manitoba	1949-61	436
New Mexico Dept. of Game & Fish	New Mexico	1957-61	435
C. D. Stutzenbaker	Texas	1949-61	433
J. L. Nelson	Saskatchewan	1959-61	430
Arizona Game & Fish Department	Arizona	1949-61	429
Agassiz NWR	Minnesota	1937-59	427
Swan Lake NWR	Missouri	1941-56	413
Charles Graham	Saskatchewan	1961	404
John Waters	Alberta & Sask.	1957-59	402
Oklahoma Dept. of Wildlife Conservation	Oklahoma	1953-56	352
L. H. Bardhausen	Wisconsin	1928-40	313
R. E. Hershey	Saskatchewan	1955-57	303
C. L. Fretwell	Utah	1937	280
A. Wetmore	Utah	1914-16	273
Muleshoe NWR	Texas	1944-52	256
John L. Lynch	Saskatchewan	1949	246
New York Conservation Department	New York	1945-61	244
Arnold Erickson	Minnesota	1948-61	242
Lower Souris NWR	North Dakota	1936-59	240
Walter Price	Saskatchewan	1957-59	226
Joseph Hopkins	Alberta	1957-58	225
L. M. Martin	Saskatchewan	1955-61	222
L. G. Sugden	British Columbia	1957-59	222
James D. Birch	Alberta	1954-55	221
D. S. Dupee	Saskatchewan	1959-60	212
Ian Cowan	British Columbia	1948-54	210

Table 3.--Average annual breeding population indexes of green-winged teal and indexes of birds per square mile in areas sampled by the breeding ground survey, 1956-63

Sample area	Number of most recent consecutive years sampled	Average breeding population index	Population index per square mile
Alaska (all strata)	5	2,825	0.04
Yukon, Old Crow Flats	4	875	0.44
Wooded Mackenzie River Delta	5	1,640	0.33
Coastal tundra between Mackenzie and Anderson Rivers, NWT	5	0	0
Taiga between Coppermine and Aklavik, NWT	5	2,960	0.05
Taiga between Great Bear and Great Slave Lakes, NWT	5	6,300	0.08
East of North Arm, Great Slave Lake, NWT	5	7,100	1.75
East and west of Great Slave Lake, NWT	5	34,000	0.34
Slave River parklands	5	23,400	1.93
Alberta, western end of Lake Athabasca	5	3,100	1.91
Alberta, Lake Hay-Fort Nelson area	5	47,700	0.41
Alberta, Lesser Slave Lake area	5	23,400	0.30
Alberta, stratum A (mixed prairie)	5	11,220	0.56
Alberta, stratum B (aspen parklands)	8	28,906	1.11
Alberta, stratum C (shortgrass prairie)	8	9,234	0.57
Saskatchewan, stratum A-E (aspen parklands)	7	2,040	0.14
Saskatchewan, stratum A-W (mixed prairie)	7	3,670	0.08
Saskatchewan, stratum B (aspen parklands)	7	25,700	0.47
Saskatchewan, stratum C (shortgrass prairie)	7	1,130	0.10
Manitoba, stratum A (mixed prairie)	8	1,000	0.09
Manitoba, stratum B (aspen parklands)	8	3,000	0.10
Manitoba, stratum C (parkland boreal)	3	2,000	0.03
Manitoba, stratum D (Saskatchewan River delta)	3	1,000	0.25
North and South Dakota, Minnesota central stratum (prairie)	6	1,000	0.01
Southern Ontario and southern Quebec (mixed forest)	4	2,710	0.02
Boreal and open boreal forest of Quebec and Ontario	4	10,500	0.01

Table 4.--Annual variations in breeding population indexes of green-winged teal (in thousands), 1954-63

Region	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963
Alaska	--	27	5	6	7	2	1	4	2	4
Northern Alberta and Northwest Territories	143	29	108	70	122	281	144	152	60	117
Southern Alberta	58	55	27	31	34	72	54	64	14	15
Southern Saskatchewan	19	52	62	33	24	18	30	13	2	9
Southern Manitoba	8	4	2	3	7	4	2	5	T	5
North Dakota, South Dakota and Minnesota	3	1	10	3	1	0	0	2	3	1
Northern Saskatchewan, northern Manitoba and western Ontario	6	13	7	6	0	16	6	6	14	10
Total	237	181	221	152	195	393	237	246	95	161

Total corrected for comparability
of technique and coverage:

Table 5.--Numbers of green-winged teal recorded in winter waterfowl surveys, 1948-63

	Atlantic Flyway	Mississippi Flyway	Central Flyway	Pacific Flyway	Canada	Mexico	Total
1948	37,000	175,737	66,150	176,283	29,851	108,384	593,405
1949	65,851	262,130	39,992	124,221	27,951	48,642	568,787
1950	24,807	231,667	71,308	91,609	9,565	31,888	460,844
1951	33,982	216,020	42,300	178,409	18,204	175,697	664,612
1952	100,438	270,878	90,097	191,054	8,717	213,547	874,731
1953	61,199	364,534	56,473	184,978	13,170	68,430	748,784
1954	30,725	213,950	61,711	186,079	19,965	131,420	643,850
1955	38,738	224,411	59,171	197,960	40,032	242,281	802,593
1956	47,222	494,593	43,727	238,949	5,109	229,181	1,058,781
1957	39,026	358,235	52,969	193,393	640	No survey	
1958	53,341	310,837	191,635	256,848	300	162,820	975,781
1959	47,946	415,368	235,949	288,859	1,664	574,882	1,564,068
1960	73,656	449,347	126,267	230,685	520	232,821	1,113,196
1961	89,388	454,617	110,216	221,881	5,969	278,590	1,157,572
1962	73,100	520,543	68,126	273,898	4,739	236,708	1,177,114
1963	109,660	509,630	151,516	282,813	3,301	205,309	1,262,229
Average							
1948-56	48,885	272,658	58,992	174,394	19,174	138,830	712,932
1958-63	74,515	443,390	147,285	259,164	2,749	281,855	1,208,327
Percent							
1948-56	6.8	38.2	8.3	24.5	2.7	19.5	
1958-63	6.2	36.7	12.2	21.4	0.2	23.3	

Table 6.--Numbers of green-winged teal banded in summer at major locations in the summer reference areas, with references for each location to detailed information in the Appendix tables and maps

Reference area	Total bandings	Major banding location	Appendix Tables	Maps
Maritimes				
Labrador	213	Tinker Harbour	A-1	A-1
Newfoundland	88	Grand Codroy River	A-1	A-2
Nova Scotia, New Brunswick and Prince Edward Island	157	Pointe de Bute, Nyanza, Cape Breton Island, Nova Scotia	A-1	A-3
Baie Johan Beetz	1,714	Baie Johan Beetz, Quebec	A-2	A-4
Eastern Lake Ontario	298	Perch Lake WMA, Montezuma NWR, New York	A-3	A-5
Western Lake Ontario	478	Oshawa, Ontario	A-3	A-6
Upper Great Lakes	123	Seney NWR, Michigan	A-3	A-7
North Central Manitoba	1,157	Delta Station, Whitewater Lake, The Pas	A-4	A-8
Minnesota	1,076	Roseau River WMA, Thief Lake WMA, Agassiz NWR, Rice Lake NWR	A-5	A-9
Southeastern Saskatchewan	802	Yorkton	A-6	A-10
North Dakota	522	Lower Souris NWR, Des Lacs NWR	A-6	A-11
South Dakota	312	Sand Lake NWR, Waubay NWR	A-6	A-12

Table 6.--Numbers of green-winged teal banded in summer at major locations in the summer reference areas, with references for each location to detailed information in the Appendix tables and maps--continued

Reference area	Total bandings	Major banding location	Appendix	
			Tables	Maps
<u>Saskatchewan-Northern Alberta</u>	13,313	White Heron, Pel and Kutawagan Lakes, Lake Center	A-7	A-13
Northern Alberta	564	Lake Clair	A-8	A-14
Mackenzie	237	Yellowknife, Mills Lake	A-8	A-15
<u>Alberta-Montana</u>	3,602	Winigami Lake, Louisiana Lakes, Pollock	A-9	A-16
Alberta	1,156	Freezeout Lake WMA	A-9	A-17
Central Montana	1,354	Tetlin and Minto Lakes, Innoko River	A-10	A-18
<u>Alaska</u>				
<u>Rocky Mountains</u>	513	Kamloops and Quesnel Regions	A-11	A-19
<u>Central British Columbia</u>	1,011	Moses Lake WMA, McNary NWR, Columbia River, Yakima County	A-11	A-20
Eastern Washington	188	Various locations	A-11	A-21
Western Montana				
<u>Puget Sound</u>				
Coastal Washington	853	Skagit Bay	A-12	A-22
Western Oregon	383	Sauvie Island	A-12	A-23

Table 6.--Numbers of green-winged teal banded in summer at major locations in the summer reference areas, with references for each location to detailed information in the Appendix tables and maps--continued

Reference area	Total bandings	Major banding location	Appendix	
			Tables	Maps
<u>Central Valley</u>				
<u>Interior Oregon</u>	454	Summer Lake WMA, Malheur NWR	A-13	A-24
<u>Central California</u>	398	Los Banos, Grey Lodge and Honey Lake WMA	A-13	A-25
<u>Salt Lake Valley</u>	1,760	Ogden Bay WMA, Bear River NWR, Utah	A-14	A-26
<u>Colorado-Wyoming</u>	1,075	Jackson County, Colorado, Hutton Lake WMA, Wyoming	A-15	A-27
<u>Imperial Valley</u>	1,237	Salton Sea, California, Overton WMA, Nevada	A-16 A-28, A-29	

Table 7.--Numbers of green-winged teal banded at major banding locations in the fall, with references for each location to detailed information in the Appendix tables and maps

Banding area	Banding month	Total bandings	Major banding locations	Tables	Appendix Maps
Labrador	Sept.	187	Tinker Harbour	A-17	A-1
Newfoundland	Sept.-Oct.	1,259	Grand Codroy River	A-18	A-2
Baie Johan Beetz	Sept.-Oct.	2,636	Baie Johan Beetz	A-19, A-20	A-4, A-30
Mid-Atlantic States	Oct.-Jan.	415	Chincoteague NWR, Virginia; Brigantine NWR, New Jersey	-	A-31
Ohio-West Virginia	Oct.-Dec.	71	Various locations in both States	A-21	A-32
Lake Michigan	Oct.-Nov.	412	Green Bay, Wisconsin; Cook County, Illinois	A-22	A-33, A-34
Manitoba	Sept.-Oct.	838	Delta Station	A-23	A-8, A-35
Minnesota	Oct.	880	Agassiz NWR, Rice Lake NWR	A-24	A-9
Southern Saskatchewan	Sept.-Oct.	501	Last Mountain Lake	A-25	A-36
Northern Alberta and Mackenzie	Sept.	590	Mills Lake, Mackenzie	A-26	A-14, A-15
Missouri	Oct.-Dec.	156	Squaw Creek NWR, Swan Lake NWR	A-27	A-37, A-38
Kansas, Oklahoma and Northern Texas	Oct.-Jan.	938	Lakin, Kansas; Tulsa, Salt Plains NWR, Oklahoma	A-28	A-39, A-40

Table 7.-Numbers of green-winged teal banded at major banding locations in the fall, with references for each location to detailed information in the Appendix tables and maps--continued

Banding area		Total bandings	Major banding locations	Tables	Appendix Maps
Louisiana	Oct.-Jan.	1,249	Avery Island	A-29	A-41
Puget Sound	Oct.-Jan.	5,916	Chilliwack, British Columbia; Skagit Bay, Washington	A-30	A-42, A-43
Eastern Washington and northern Idaho	Oct.	1,240	McNary NWR, Washington; Boundary County, Idaho	A-31	A-44, A-45
Interior Oregon	Oct.-Dec.	6,838	Summer Lake WMA, Malheur NWR	A-32	A-46, A-47
Coastal California and Oregon	Oct.-Jan.	531	Coos Bay, Oregon; Humboldt Bay, California	A-33	A-48, A-49
Central California	Oct.-Jan.	1,800	Los Banos WMA, Grey Lodge WMA	A-34	A-50, A-51
Salton Sea	Oct.-Jan.	1,463	Salton Sea	A-35	A-52, A-53
Arizona	Dec.-Jan.	215	Maricopa County	A-36	A-54
New Mexico-Colorado	Oct.	633	Bosque Del Apache NWR, New Mexico; Monte Vista NWR, Colorado	A-37	A-55, A-56

Table 8.--Numbers of green-winged teal banded in winter at major locations in the winter reference areas, with references for each location to detailed information in the Appendix tables and maps

Reference area	Total bandings	Major banding location	Appendix	
			Tables	Maps
Delaware and Chesapeake Bays	108	Various locations	A-38	A-77
Mid-Atlantic States	375	Mattamuskeet NWR, Currituck Sound, North Carolina	A-38	A-58
South-Central	423	Avery Island, Louisiana; Salt Plains NWR, Oklahoma; Rockport, Texas	A-39	A-59
Colorado	120	Southeastern Colorado	A-40	A-60
Puget Sound	2,045	Ladner and Pitt Rivers, British Columbia; Yakima County, Washington; Sauvie Island WMA, Wilson GMA and Umatilla County, Oregon	A-41	A-61
Central Valley	1,306	Summer Lake WMA, Oregon; Humboldt Bay, Los Banos WMA, Grey Lodge WMA, California	A-42	A-62
Imperial Valley	14,400	Salton Sea, California; Overton WMA, Nevada; southwestern Arizona	A-43	A-63

Table 9.--Numbers of green-winged teal banded in spring at major banding locations, with references for each location to detailed information in Appendix tables and maps

Banding area	Total bandings	Major banding location	Tables	Maps
Louisiana and southern Texas	453	Avery Island, Louisiana; Waco, Texas	A-44	A-64
Northern Texas and Oklahoma	1,990	Muleshoe NWR, Hagerman NWR, Texas; Salt Plains NWR, Tulsa, Oklahoma	A-45	A-65
Kansas	3,258	Lakin, Quivira NWR	A-46	A-66
Missouri	968	Squaw Creek NWR, Swan Lake NWR	A-47	A-67
Nebraska and South Dakota	613	Southwestern Nebraska, Sand Lake NWR, South Dakota	A-48	A-68
Puget Sound	1,346	Pitt River and Chilliwack, British Columbia	A-49	A-69
Oregon	571	Summer Lake WMA, Malheur NWR	A-50	A-70
Southern Idaho	275	North Lake WMA	A-51	A-71
Central Valley	525	Los Banos WMA	A-52	A-72
Imperial Valley	3,026	Salton Sea	A-53	A-73
Nevada	1,435	Ruby Lake NWR, Overton WMA	A-54	A-74

Table 10.--Estimated harvest of green-winged teal, by flyways, 1952-64

[In thousands. Estimates for 1952-53 through 1954-55 include retrieved and unretrieved birds; estimates for 1955-56 through 1963-64 include retrieved birds only]

Hunting season	Atlantic Flyway	Mississippi Flyway	Central Flyway	Pacific Flyway	Total U.S.
1952-53	57	626	495	293	1,471
1953-54	85	485	277	488	1,335
1954-55	95	436	404	379	1,314
1955-56	63	272	316	241	892
1956-57	67	438	405	303	1,213
1957-58	60	289	652	308	1,309
1958-59	43	356	410	368	1,177
1959-60	35	240	186	266	727
1960-61	65	181	189	255	690
1961-62	51	141	107	251	550
1962-63	45	63	48	235	391
1963-64	61	164	125	376	727

Table 11.--Percent of the green-winged teal harvest in each State and flyway, 1960-64

Flyway and State	Percent of total harvest			
	1960-61	1961-62	1962-63	1963-64
<u>Atlantic Flyway</u>				
Maine	0.8	0.9	1.2	0.6
Vermont	0.2	0.2	0.6	0.1
New Hampshire	0.4	0.1	0.1	0.1
Massachusetts	0.6	0.8	0.5	0.4
Connecticut	0.3	0.1	0.7	0.2
Rhode Island	0.1	T	T	T
New York	1.6	1.4	1.2	0.7
Pennsylvania	0.7	0.3	0.4	0.3
West Virginia	--	T	T	--
New Jersey	0.6	0.5	1.5	0.7
Delaware	1.0	1.2	0.5	0.6
Maryland	0.4	0.2	0.6	0.5
Virginia	0.8	0.3	0.6	0.3
North Carolina	1.1	0.6	0.9	0.5
South Carolina	0.2	0.2	0.9	0.4
Georgia	0.1	0.2	0.4	0.2
Florida	1.0	1.2	1.5	1.6
Total	9.9	8.3	11.6	8.5
<u>Mississippi Flyway</u>				
Minnesota	8.2	8.3	4.4	5.1
Wisconsin	5.3	5.3	2.7	2.4
Michigan	1.9	1.7	2.0	1.3
Iowa	2.6	3.3	2.1	2.1
Illinois	2.1	2.1	1.7	1.9
Indiana	0.1	0.3	0.2	0.2
Ohio	1.0	0.7	0.9	0.5
Missouri	0.6	1.6	0.6	0.6
Kentucky	T	T	T	T
Arkansas	0.7	0.2	0.2	0.5
Tennessee	0.2	0.2	0.1	0.6
Louisiana	2.3	1.8	3.0	5.8
Mississippi	0.3	0.2	0.4	1.0
Alabama	0.2	0.1	0.2	0.6
Total	25.3	25.6	18.6	22.6

Table 11.--Percent of the green-winged teal harvest in each State and flyway, 1960-64--continued

Flyway and State	Percent of total harvest			
	1960-61	1961-62	1962-63	1963-64
<u>Central Flyway</u>				
Montana	1.0	0.9	0.3	0.6
North Dakota	2.1	0.7	1.1	1.4
South Dakota	4.6	1.4	1.0	2.9
Wyoming	0.3	0.1	0.2	0.1
Nebraska	3.5	1.2	1.6	2.8
Colorado	1.2	0.9	0.8	1.1
Kansas	4.8	5.8	2.9	3.4
New Mexico	0.1	0.3	0.2	0.6
Oklahoma	4.2	1.7	1.3	1.0
Texas	6.8	7.0	5.5	4.2
Total	28.5	20.0	14.9	17.2
<u>Pacific Flyway</u>				
Washington	4.5	6.3	7.4	6.6
Oregon	2.2	3.4	5.0	3.6
Idaho	1.4	2.3	2.3	1.6
California	22.8	27.6	32.4	32.6
Nevada	0.8	0.8	1.7	1.3
Utah	3.7	4.2	3.8	4.3
Arizona	0.8	0.6	1.5	1.2
Total	36.2	45.2	54.1	51.7
Grand total	99.9	99.1	99.2	100.0

Table 12.--Percent of green-winged teal in the duck bag of States and flyways, 1960-64

Flyway and State	Percent of total kill				Rank in the bag
	1960-61	1961-62	1962-63	1963-64	
<u>Atlantic Flyway</u>					
Maine	14.7	15.2	13.2	15.4	2
Vermont	9.3	9.3	11.2	7.6	4-5
New Hampshire	17.5	8.1	6.1	7.1	3
Massachusetts	6.2	8.0	4.8	6.3	4-5
Connecticut	7.2	5.6	8.7	8.3	5
Rhode Island	4.4	2.4	--	3.3	6
New York	5.2	4.9	3.6	4.7	5
Pennsylvania	6.5	3.6	2.5	3.1	7
West Virginia	0.6	1.4	2.6	1.2	6-8
New Jersey	7.0	8.0	7.0	9.9	3
Delaware	17.8	28.9	11.5	23.0	3
Maryland	3.6	3.2	4.1	7.0	4
Virginia	11.9	5.5	5.0	4.5	6
North Carolina	11.7	8.3	7.1	6.3	6-7
South Carolina	5.4	3.6	6.5	5.5	5-6
Georgia	6.7	--	5.3	2.9	4-6
Florida	10.5	6.3	6.0	8.0	4-6
Weighted average	8.3	6.9	5.9	7.0	5
Number of wings	1,088	640	962	1,342	
<u>Mississippi Flyway</u>					
Minnesota	7.4	12.1	5.8	6.4	5-6
Wisconsin	8.6	9.5	5.4	5.9	5-6
Michigan	5.8	7.5	6.8	7.3	5
Iowa	11.1	13.3	12.5	10.4	3-4
Illinois	6.5	5.5	7.5	7.6	3
Indiana	2.0	5.2	6.5	9.5	4
Ohio	6.5	7.8	7.8	5.2	4
Missouri	2.5	6.8	8.2	6.6	4
Kentucky	1.3	0.5	1.0	2.7	5-6
Arkansas	1.6	1.7	1.5	2.9	5
Tennessee	1.5	2.3	--	6.0	5-6
Louisiana	4.6	4.3	6.9	6.2	4-6
Mississippi	3.6	6.7	3.8	8.0	3-4
Alabama	5.1	2.7	3.4	7.3	7-8
Weighted average	5.9	8.2	6.2	6.5	3-5
Number of wings	1,333	1,129	1,441	1,885	

Table 12.--Percent of green-winged teal in the duck bag of States and flyways, 1960-64--continued

Flyway and State	Percent of total kill			Rank in the bag
	1961-62	1962-63	1963-64	
<u>Central Flyway</u>				
Montana	4.7	3.9	5.4	3-4
North Dakota	4.8	4.3	5.6	5-6
South Dakota	7.6	6.4	9.3	3-4
Wyoming	4.1	4.8	4.3	2-3
Nebraska	5.5	14.9	18.4	2
Colorado	9.0	10.2	10.7	2
Kansas	29.2	26.9	27.1	1-2
New Mexico	17.2	13.1	15.1	2-3
Oklahoma	14.7	20.3	18.9	2
Texas	17.7	12.4	10.7	3
Weighted average	12.6	10.7	11.6	2
Number of wings	1,104	1,123	2,135	
<u>Pacific Flyway</u>				
Washington	8.6	10.0	10.9	3-4
Oregon	9.7	12.1	11.0	4
Idaho	6.6	5.4	4.9	3
California	14.6	15.8	16.1	2-3
Nevada	17.9	18.8	16.3	2
Utah	18.4	12.0	13.2	3
Arizona	18.7	29.4	24.0	1-2
Weighted average	12.4	13.1	13.6	3
Number of wings	1,381	2,112	3,440	

Table 13.--Comparison of the percent of green-winged teal harvest in the period 1960-63 and the percent of band recoveries during the period 1946-61

State of recovery	Range in percent of U.S. harvest	Distribution of band recoveries	
		As percent of all U.S. recoveries	Percent of all U.S. recoveries minus those in the State of banding
<u>Atlantic Flyway</u>			
Maine	0.6 - 1.2	0.9	1.0
Vermont	0.1 - 0.6	T	0.0
New Hampshire	0.1 - 0.4	0.0	0.0
Massachusetts	0.4 - 0.8	0.4	0.5
Connecticut	0.1 - 0.7	0.0	0.0
Rhode Island	T - 0.1	0.0	0.0
New York	0.7 - 1.6	1.1	0.9
Pennsylvania	0.3 - 0.7	0.1	0.1
West Virginia	T	0.0	0.0
New Jersey	0.5 - 1.5	0.6	0.8
Delaware	0.5 - 1.2	0.5	0.7
Maryland	0.2 - 0.6	0.3	0.4
Virginia	0.3 - 0.8	0.4	0.6
North Carolina	0.5 - 1.1	0.9	1.2
South Carolina	0.2 - 0.9	0.6	0.8
Georgia	0.1 - 0.4	0.0	0.0
Florida	1.0 - 1.6	0.7	0.9
Total	8.3 - 11.6	6.6	7.9
<u>Mississippi Flyway</u>			
Minnesota	4.4 - 8.3	4.4	2.5
Wisconsin	2.4 - 5.3	0.5	0.5
Michigan	1.3 - 2.0	0.3	0.4
Iowa	2.1 - 3.3	1.1	1.5
Illinois	1.7 - 2.1	1.1	1.5
Indiana	0.1 - 0.3	T	T
Ohio	0.5 - 1.0	0.1	0.1
Missouri	0.6 - 1.6	1.1	1.5
Kentucky	T	0.0	0.0
Arkansas	0.2 - 0.7	1.2	1.6
Tennessee	0.1 - 0.6	0.1	0.2
Louisiana	1.8 - 5.8	5.1	6.6
Mississippi	0.2 - 1.0	0.3	0.4
Alabama	0.1 - 0.6	0.1	0.2
Total	18.6 - 25.6	15.4	17.0

Table 13.--Comparison of the percent of green-winged teal harvest in the period 1960-63 and the percent of band recoveries during the period 1946-61--continued

State of recovery	Range in percent of U.S. harvest	Distribution of band recoveries		
		As percent of all U.S. recoveries	Percent of all U.S. recoveries minus those in the State of banding	
<u>Central Flyway</u>				
Montana	0.3 - 1.0	0.6		0.4
North Dakota	0.7 - 2.1	1.1		1.4
South Dakota	1.0 - 4.6	1.2		1.4
Wyoming	0.1 - 0.3	0.1		0.1
Nebraska	1.2 - 3.5	1.8		2.3
Colorado	0.8 - 1.2	0.7		0.6
Kansas	2.9 - 5.8	2.9		3.8
New Mexico	0.1 - 0.6	0.3		0.4
Oklahoma	1.0 - 4.2	1.4		1.8
Texas	4.2 - 7.0	9.9		12.9
Total	14.9 - 28.5	20.0		25.1
<u>Pacific Flyway</u>				
Washington	4.5 - 7.4	7.1		3.4
Oregon	2.2 - 5.0	4.5		3.0
Idaho	1.4 - 2.3	0.8		1.0
California	22.8 - 32.6	36.8		35.0
Nevada	0.8 - 1.7	2.2		2.1
Utah	3.7 - 4.3	5.2		5.4
Arizona	0.6 - 1.5	0.5		0.7
Total	36.2 - 54.1	57.1		50.6
Total kill (in thousands)	391 - 727			
Total U.S. recoveries		2,006		1,551

Table 14.--Comparison of green-winged teal breeding population indexes, harvest in the United States, and numbers of duck stamps sold, 1955-63
 (in thousands)

Year	Breeding population index	Harvest	Number of duck stamps sold
1955	228	892	2,370
1956	221	1,213	2,332
1957	154	1,309	2,355
1958	197	1,177	2,166
1959	394	727	1,628
1960	239	690	1,728
1961	247	550	1,346
1962	95	391	1,140
1963	160	727	1,455

Table 15.--Factors affecting the harvest of green-winged teal in Minnesota and Kansas, 1960-63

	1960	1961	1962	1963
<u>Minnesota</u>				
Hunting season dates	Oct. 8 - Nov. 16	Oct. 14 - Nov. 12	Oct. 13 - Nov. 6	Oct. 5 - Nov. 8
Season length (days)	40	30	25	35
Daily bag limit	4	2	2 (1 mallard)	4 (2 mallards)
Number of hunters	139,065	85,250	78,071	111,977
Green-winged teal kill estimate	73,700	58,940	19,030	47,426
Percent species composition	7.4	12.1	5.8	6.4
<u>Kansas</u>				
Hunting season dates	Oct. 15 - Dec. 13	Oct. 28 - Nov. 26	Nov. 3 - Nov. 27	Oct. 26 - Nov. 29
Season length (days)	60	30	25	35
Daily bag limit	3	3	2 (1 mallard)	4 (2 mallards)
Number of hunters	50,806	40,275	21,988	28,797
Green-winged teal kill estimate	43,000	41,140	12,500	31,815
Percent species composition	21.9	29.2	26.9	27.1

Table 16.--Distribution of recoveries, by flyways, of green-winged teal banded in the Prairie Provinces

<u>Banded in --</u>	<u>Number recovered</u>		<u>Percent recovered in --</u>				
	<u>Immature</u>	<u>Adults</u>	<u>Mississippi Flyway</u>	<u>Central Flyway</u>	<u>Immature</u>	<u>Adults</u>	<u>Pacific Flyway</u>
North-Central reference area	143	132	59	42	27	36	1
Saskatchewan and northern Alberta	48	608	21	20	58	35	6
Alberta reference area	53	170	4	4	30	16	43
							79

Table 17.--Distribution of recoveries, in the southern tier of States, of green-winged teal banded in the Prairie Provinces

<u>Banded in --</u>	<u>Number recovered</u>		<u>Percent recovered in the southern parts of the --</u>				
	<u>Immature</u>	<u>Adults</u>	<u>Mississippi Flyway</u>	<u>Central Flyway</u>	<u>Immature</u>	<u>Adults</u>	<u>Pacific Flyway</u>
North-Central reference area	143	132	18	12	12	11	1
Saskatchewan and northern Alberta	48	608	8	12	38	22	4
Alberta reference area	53	170	2	3	17	10	43
							72

¹/Arkansas, Tennessee, Louisiana and Mississippi.²/Oklahoma, New Mexico and Texas.³/California, Nevada, Utah and Arizona.

Table 18.--Percent of banded green-winged teal recovered monthly during the hunting season in the United States

Banded in --	Age at recovery	Number recovered	Percent recovered in --				
			Sept.	Oct.	Nov.	Dec.	Jan.
Baie Johan Beetz, Quebec	Immature	98	3	47	27	17	6
	Adult male	28	-	38	35	19	8
	Adult female	17	13	31	25	31	-
North-Central	Immature	143	4	57	29	9	1
	Adult (mostly male)	132	3	36	34	23	3
Saskatchewan and northern Alberta	Immature	48	2	33	42	17	6
	Adult male	559	-	23	32	34	11
	Adult female	49	2	30	30	28	11
Alaska	Immature	38	3	32	44	15	6
	Adult male	29	-	7	26	48	19

Table 19.---Percentage distribution of harvest of green-winged teal, by months, 1960-63

Killed in --	Number of wings received	Percent killed in month of --														
		1960	1961	1962	October	1960	1961	1962	November	1960	1961	1962	December	1960	1961	1962
<u>Atlantic Flyway</u>																
Maine	264	135	151	96	83	96	3	17	3	1	-	-	-	-	-	-
Vermont	55	40	75	82	95	77	18	5	22	-	-	-	-	-	-	-
New Hampshire	22	10	25	100	70	100	-	30	-	-	-	-	-	-	-	-
Massachusetts	64	50	56	41	76	95	59	22	-	-	2	5	-	-	-	-
Connecticut	25	17	65	80	-	82	4	82	17	16	18	1	-	-	-	-
New York	95	94	74	74	89	88	26	7	9	-	3	3	-	-	-	-
Pennsylvania	34	11	37	76	46	65	24	46	35	-	9	-	-	-	-	-
New Jersey	134	89	149	-	-	-	70	57	81	25	44	19	5	-	-	-
Delaware	69	89	60	-	-	-	94	88	85	6	12	15	-	-	-	-
Maryland	42	13	60	-	-	-	41	69	83	59	31	17	-	-	-	-
Virginia	81	38	35	-	-	-	38	87	54	57	13	46	5	-	-	-
North Carolina	129	45	60	-	-	-	37	36	52	62	65	48	2	-	-	-
South Carolina	25	12	30	-	-	-	4	8	30	72	92	70	24	-	-	-
Florida	75	52	102	-	-	-	-	61	31	96	39	69	4	-	-	-
Total	1,099	702	977	40	41	43	32	41	37	26	18	20	2	-	-	-
<u>Mississippi Flyway</u>																
Minnesota	199	209	283	98	96	93	2	4	7	-	-	-	-	-	-	-
Wisconsin	217	188	272	93	90	90	7	10	10	-	-	-	-	-	-	-
Michigan	92	105	160	90	88	93	10	12	7	-	-	-	-	-	-	-
Iowa	123	133	86	89	78	62	11	22	38	-	-	-	-	-	-	-
Illinois	115	92	85	50	53	53	50	47	47	-	-	-	-	-	-	-
Indiana	17	24	37	-	-	-	100	96	100	-	4	-	-	-	-	-
Missouri	40	62	52	-	-	-	95	100	5	5	-	-	-	-	-	-
Arkansas	48	9	16	-	-	-	37	33	-	63	67	100	-	-	-	-
Tennessee	28	14	-	-	-	-	21	-	-	79	100	-	-	-	-	-
Louisiana	95	63	211	-	-	-	73	100	9	20	-	91	7	-	-	-
Mississippi	25	15	18	-	-	-	36	-	-	56	100	100	8	-	-	-
Alabama	31	7	42	-	-	-	55	-	-	45	100	100	-	-	-	-
Total	1,103	967	1,358	64	65	61	25	28	19	10	5	21	1	-	-	-

Table 19.--Percentage distribution of harvest of green-winged teal, by months, 1960-63--continued

Killed in --	Number of wings received	Percent killed in month of --									
		October		November		December		January			
		1961	1962	1961	1962	1961	1962	1961	1962	1961	1962
<u>Central Flyway</u>											
Montana	58	21	93	90	7	10	-	-	-	-	-
North Dakota	37	74	100	86	-	14	-	-	-	-	-
South Dakota	18	62	83	42	17	58	-	-	-	-	-
Nebraska	83	30	68	53	32	47	-	-	-	-	-
Colorado	101	68	-	68	90	32	10	-	-	-	-
Kansas	435	264	41	-	60	100	-	-	-	-	-
New Mexico	70	26	34	-	-	-	66	100	-	-	-
Oklahoma	48	94	-	-	100	95	-	5	-	-	-
Texas	178	381	-	-	55	-	45	100	-	-	-
Total	1,033	1,021	36	12	49	47	11	41	-	-	-
<u>Pacific Flyway</u>											
Washington	149	363	40	56	37	26	23	18	-	-	-
Oregon	165	213	30	29	33	23	35	45	2	3	-
Idaho	67	92	64	51	28	26	8	23	-	-	-
California	686	869	36	37	12	14	41	37	11	11	-
Nevada	68	78	63	56	12	26	22	18	3	-	-
Utah	147	298	75	69	15	15	10	16	-	-	-
Arizona	27	78	41	30	-	13	48	49	11	9	-
Total	1,309	1,991	43	46	19	18	32	31	6	5	-

Table 20.--Derivation by Province and State of summer-banded green-winged teal (Provinces or States with less than 10 recoveries not shown)

	Recovered in --	Number of recoveries	Percent banded in --
<u>Canada</u>			
Prince Edward Island	13	8	23
Nova Scotia	17	6	53
New Brunswick	29	7	3
Quebec	20	5	5
Ontario	19	17	21
Manitoba	22	42	5
Saskatchewan	10	82	9
British Columbia	15	10	60
<u>Atlantic Flyway</u>			
Maine	18	11	83
New York	22	5	54
New Jersey	13	8	31
Delaware	11	27	45
North Carolina	19	5	74
South Carolina	12	50	25
Florida	14	57	14
<u>109</u>	<u>3</u>	<u>13</u>	<u>58</u>
		16	6
		1	1
		2	2
<u>Mississippi Flyway</u>			
Minnesota	89	2	11
Wisconsin	11	18	27
Iowa	23	4	4
Illinois	23	4	9
Missouri	23	4	22
Arkansas	24	4	22
Louisiana	102	4	4
<u>295</u>	<u>2</u>	<u>1</u>	<u>1</u>
		12	26
		5	43
		4	4
		1	1
		1	1
		1	1
		1	1

Table 20.—Derivation by Province and State of summer-banded green-winged teal (Provinces or States with less than 10 recoveries not shown)—con.

	Recovered in ==	Number of recoveries	Percent banded in ==
<u>Central Flyway</u>			
Montana	12		
North Dakota	23		
South Dakota	24		
Nebraska	36		
Colorado	15		
Kansas	58		
Oklahoma	28		
Texas	199		
Newfoundland	-	395	
Quebec			
New York			
Michigan			
Wisconsin			
Minnesota			
Alab. & S. Dakota			
Saskatchewan			
Alberta			
MacKenzie Ile			
Montana			
Alaska			
British Columbia			
Washington			
Oregon			
Idaho			
California			
Nevada			
Utah			
Arizona			
<u>Pacific Flyway</u>			
Washington	142		
Oregon	91		
Idaho	16		
California	738		
Nevada	45		
Utah	104		
Arizona	11		
Total	1,147		

Table 21.—Direct recovery rates (percent) of green-winged teal banded during the summer

Banded in -	Period of banding	Number banded	Number recovered	Direct recovery rates
		Adults	Immature	Adults Immature
Maritimes	1946-61	43	387	4 28 9.3 7.2
Baie Johan Beetz	1947-61	223	1,491	7 98 3.1 6.6
Eastern Lake Ontario	1952-61	77	220	3 20 3.9 9.1
Western Lake Ontario	1955-61	99	379	3 20 3.0 5.3
Manitoba	1946-61	398	758	11 48 2.8 6.3
Minnesota	1946-61	153	921	11 69 7.2 7.5
North and South Dakota	1931-46	298	52	22 4 7.4 7.7
	1946-61	269	173	10 4 3.7 4.6
Sask. and northern Alberta	1946-61	12,579	1,603	331 41 2.6 2.6
Alberta	1946-61	2,717	885	60 29 2.2 3.3
Central Montana	1959-60	426	730	11 16 2.6 2.2
Alaska	1948-61	780	585	28 37 3.6 6.3
Puget Sound	1946-61	381	855	36 105 9.4 12.3
Central Valley	1926-41	280	94	13 8 4.6 8.5
	1946-61	510	498	41 41 8.0 8.2
Salt Lake Valley	1924-35	717	39	35 1 4.9 2.6
	1946-61	643	329	14 13 2.2 4.0
Colorado-Wyoming	1953-61	956	119	9 3 0.9 2.5
Imperial Valley	1950-59	547	690	60 47 11.0 6.8

Table 22.--Direct recovery rates (percent), by age and sex, of green-winged teal banded during the summer
 (at least 100 birds of each sex were banded)

Reference area	Number banded				Number recovered				Direct recovery rate			
	Adult		Immature		Adult		Immature		Adult		Immature	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Maritimes	--	--	186	182	--	--	18	9	--	--	9.7	4.9
Baie Johan Beetz	--	--	810	668	--	--	63	35	--	--	7.8	5.2
Eastern Lake	--	--	101	109	--	--	8	12	--	--	7.9	11.0
Ontario	--	--	177	202	--	--	9	11	--	--	5.1	5.4
Western Lake	--	--	516	380	--	--	43	25	--	--	8.3	6.6
Manitoba and south-eastern Sask.	874	165	463	456	26	1	26	27	3.0	0.6	5.6	5.9
Minnesota	--	--	northern Alberta	937	815	785	310	20	19	22	2.7	2.1
Saskatchewan and Alberta	11,640	2,405	311	455	415	52	7	17	11	2.2	2.2	2.3
Central Montana	205	219	326	403	6	5	8	8	2.9	2.3	2.4	2.7
Rocky Mountains	519	231	381	353	26	15	27	15	5.0	6.5	7.1	4.2
Alaska	546	223	228	20	8	15	16	16	3.7	3.6	6.8	7.0
Puget Sound	200	181	532	320	19	17	57	47	9.5	9.4	10.7	14.7
Central Valley	387	122	303	193	34	7	28	13	8.8	5.7	9.2	6.7
Salt Lake Valley	454	189	185	134	11	3	7	6	2.4	1.6	3.8	4.5
Colorado-Wyoming	710	246	--	--	6	3	--	--	0.8	1.2	--	--
Imperial Valley	420	123	429	261	51	9	27	20	12.1	7.3	6.3	7.7

Table 23.--First-hunting-season recovery rates (percent) and relative recovery rates by sex of green-winged teal banded during the winter (at least 100 birds were banded).

Reference area	Period of banding	Number banded			First season recovery rate			Relative recovery rate (male:female)
		Male	Female	Total*	Male	Female	Total	
Puget Sound	1932-42	644	547	1,191	3.4	4.0	3.7	0.85
	1949-61	459	436	895	3.5	4.4	3.9	0.79
Central Valley	1928-40	--	--	112	--	--	1.8	--
	1948-61	874	432	1,306	4.6	3.5	4.2	1.31
Imperial Valley	1950-61	10,534	3,863	14,397	4.4	3.5	4.1	1.25
Colorado	1949-51	--	--	120	--	--	2.5	--
South-Central	1916-41	346	102	476	2.3	0.0	1.9	--
	1950-61	362	178	545	3.3	1.7	2.8	1.97
Mid-Atlantic States	1951-61	236	70	307	6.8	1.7	5.5	3.98
Delaware and Chesapeake Bays	1953-60	--	--	108	--	--	5.6	--

*Total differs from the sum of males and females when birds of unknown sex are added.

Table 24.--First-hunting-season recovery rates (percent) and relative recovery rates by sex of green-winged teal banded during the spring (at least 100 birds were banded).

Banded in --	Period of banding	Number banded			First season recovery rate			Relative recovery rate (male:female)
		Male	Female	Total*	Male	Female	Total	
Puget Sound	1933-36	709	601	1,346	4.4	3.8	4.0	1.14
Oregon	1930-46	274	106	381	6.6	5.7	6.3	1.16
Idaho	1950-60	187	87	275	2.7	2.2	2.5	1.22
Nevada	1948-61	954	478	1,432	1.9	0.8	1.5	2.37
Central California	1948-57	336	189	525	6.8	3.7	5.9	1.83
Salton Sea, California	1948-60	2,065	961	3,026	4.3	2.9	3.9	1.48
Louisiana and southern Texas	1921-41 1949-52	178 50	153 69	334 119	1.7 8.0	3.9 2.9	3.0 5.0	0.43 2.75
Oklahoma and northern Texas	1934-44 1947-58	192 1,275	48 475	240 1,750	3.1 2.1	0.0 1.5	2.5 1.9	---
Kansas	1926-41	2,188	935	3,123	2.0	1.3	1.8	1.53
Missouri	1950-56	650	254	906	1.7	1.2	1.5	1.41
Nebraska and South Dakota	1950-61	404	129	533	1.7	0.8	1.5	2.12

*Total differs from sum of males and females when birds of unknown sex are added.

Table 25.--Direct recovery rates (percent) of green-winged teal banded in the Prairie Provinces during the summer

Banded in --	Age	Number banded	Recovered in --						U.S.	Total
			Mexico	Canada	Atlantic Flyway	Mississippi Flyway	Central Flyway	Pacific Flyway		
Manitoba	Immature	758	--	2.1	--	2.0	2.1	0.1	4.2	6.3
	Adult	398	--	0.0	--	1.5	0.8	0.5	2.8	2.8
Saskatchewan	Immature	983	0.1	0.1	--	0.6	1.4	0.2	2.0	2.4
	Adult	13,049	T	T	T	0.6	0.9	1.0	2.5	2.6
Alberta	Immature	1,343	0.2	0.6	--	0.2	1.4	0.9	2.6	3.3
	Adult	2,817	T	--	--	0.2	0.4	1.7	2.3	2.3

Table 26.--Relative recovery rates (immature; adult) in various harvest areas of green-winged teal banded in the Prairie Provinces

Banded in --	Mexico	Canada	Recovered in --						All areas
			Atlantic Flyway	Mississippi Flyway	Central Flyway	Pacific Flyway	U.S.		
Manitoba	--	--	--	1.3	2.6	0.2	1.5	2.3	
Saskatchewan	2.5	2.5	--	1.0	1.6	0.2	0.8	0.9	
Alberta	5.0	--	--	1.0	3.5	0.5	1.1	1.4	

Table 27.--Comparison of direct recovery rates and hunting regulations of green-winged teal banded during the summer

Banded in --	Age	Years	Banding data			Hunting regulations		
			Number banded	Direct recovery rate	Season length (days)	Daily bag limit		
Baie Johan Beetz	Immature	1949-52	434	6.2	36-55	4-6		
	Immature	1953-58	483	8.5	58-80	4-6		
	Immature	1959-61	326	5.5	36-55	2-3		
	Immature	1955-58	303	12.5	56-80	4-6		
Minnesota	Immature	1959-61	583	4.6	36-55	2-3		
	Immature	1949-52	587	3.6	36-55	4-6		
	Adult	1955-58	179	5.0	58-80	4-6		
	Adult	1959-61	560	2.7	36-55	2-3		
Manitoba and southeastern Saskatchewan	Immature	1952-58	592	3.9	58-80	4-6		
	Immature	1959-61	642	2.0	56-80	2-3		
	Adult	1949-51	2,058	2.1	36-55	4-6		
	Adult	1952-58	9,429	2.9	56-80	4-6		
Saskatchewan and northern Alberta	Adult	1959-61	815	0.6	36-55	4-6		
	Immature	1950-53	358	2.2	55-70	4-6		
	Immature	1954-60	1,214	3.0	81 or more	4-6		
	Adult	1950-53	579	2.4	55-70	4-6		
Alberta	Adult	1954-60	1,589	2.7	81 or more	4-6		
	Adult	1961	353	0.8	75	4-5		
	Immature	1950-53	236	8.5	55-70	4-6		
	Immature	1954-60	227	6.6	81 or more	4-6		
Alaska	Adult	1954-60	426	5.4	81 or more	4-6		
	Adult	1961	175	1.1	75	4-5		

Table 27.--Comparison of direct recovery rates and hunting regulations of green-winged teal banded during the summer--continued

Banded in --	Age	Banding data			Hunting regulations		
		Years banded	Number banded	Direct recovery rate	Season length (days)	Daily bag limit	
Rocky Mountains	Immature	1949-53	216	5.6	50-70	4-6	
	Immature	1954-60	652	5.7	81 or more	4-6	
Puget Sound	Adult	1954-60	125	13.6	81 or more	4-6	
	Adult	1961	239	7.5	75	4-5	
Central Valley	Immature	1949-53	217	6.0	50-70	4-6	
	Immature	1954-58	256	10.9	80 or more	4-6	
	Adult	1954-60	178	7.9	80 or more	4-6	
	Adult	1961	210	8.6	75	4-5	
Salt Lake Valley	Adult	1931-34	638	5.3	20-35	11 or more	
	Adult	1940-53	340	0.9	50-70	4-6	
	Adult	1954-60	269	3.7	75	4-5	
	Adult	1955-58	264	1.9	56-80	4-6	
Colorado-Wyoming	Adult	1959-61	589	0.5	36-55	4-6	

Table 28.--Estimated kill rates of green-winged teal based on teal banded during the summer (the kill rate is the percent of banded birds that are recovered, adjusted for band-reporting rate and crippling loss)

Area of banding	Number banded		Kill rate in Canada		Kill rate in the U.S.		Kill rate in Mexico		Total kill rate	
	Adult	Immature	Adult	Immature	Adult	Immature	Adult	Immature	Adult	Immature
<u>Canada and Alaska</u>										
Maritime	43	387	--	11.5	--	11.5	--	--	--	23.0
Baie Johan Beetz	223	1,491	4.2	9.0	5.8	12.2	--	--	10.0	21.2
Eastern Lake										
Ontario	77	220	0.0	4.5	11.7	24.6	--	--	11.7	29.1
Western Lake										
Ontario	99	379	3.0	5.5	6.0	10.0	--	0.3	9.0	15.8
Manitoba	398	758	0.0	7.1	9.5	14.2	--	9.5	21.3	
Saskatchewan	13,049	943	0.1	0.3	8.5	6.6	0.1	0.3	8.7	7.2
Alberta	2,817	1,343	0.0	2.0	7.7	8.8	0.1	0.5	7.8	11.3
Central British Columbia	266	235	0.0	0.0	19.5	21.8	0.0	1.3	19.5	23.1
Alaska	769	585	0.9	3.3	10.8	17.9	0.4	0.0	12.1	21.2
Total			1.2	4.8	9.9	14.2	0.1	0.3	11.0	19.2
<u>United States</u>										
Minnesota	153	921	--	0.3	24.4	25.2	0.0	0.0	24.4	25.5
North and South Dakota	269	173	0.0	0.0	12.5	17.6	0.0	0.0	12.5	17.6
Central Montana	424	729	--	--	8.8	7.0	0.0	0.5	8.8	7.5
Colorado-Wyoming	956	119	--	--	4.8	5.6	0.0	2.8	4.8	8.4
Central Washington	411	590	1.1	--	17.8	20.6	0.0	0.0	18.9	20.6
Puget Sound	380	860	0.0	2.2	31.8	39.1	0.0	0.0	31.8	41.3
Central Valley	510	498	--	--	27.1	27.1	0.0	0.7	27.0	27.8
Salt Lake Valley	643	329	--	--	6.9	13.1	0.5	0.4	7.4	13.5
Imperial Valley	547	690	--	--	36.0	22.6	1.1	0.4	37.1	23.0
Total			0.1	0.4	18.9	19.7	0.2	0.5	19.1	20.6

Table 29.--Source of green-winged teal band recovery reports, 1957-61

Reported from --	Number reported	Percent reported by --		
		Hunters	agency employees	Other persons
<u>Atlantic Flyway</u>				
New York	13	77	23	-
New Jersey	16	75	13	12
Delaware	12	83	17	-
Virginia	12	100	-	-
North Carolina	36	86	14	-
South Carolina	12	75	17	8
Florida	13	92	8	-
Other States	32	88	12	-
Total	146	85	13	2
<u>Mississippi Flyway</u>				
Minnesota	74	66	30	4
Iowa	19	74	26	-
Illinois	13	77	23	-
Missouri	18	72	28	-
Arkansas	13	100	-	-
Louisiana	36	94	3	3
Other States	32	78	19	3
Total	205	78	20	2
<u>Central Flyway</u>				
Nebraska	23	91	9	-
Kansas	33	94	6	-
Texas	86	90	9	1
Other States	46	76	24	-
Total	188	87	12	1
<u>Pacific Flyway</u>				
Washington	191	74	26	-
Oregon	131	49	50	1
Idaho	16	69	31	-
California	852	57	40	3
Nevada	42	40	31	29
Utah	68	69	23	8
Arizona	11	73	27	-
Total	1,311	59	38	3
Total United States	1,850	66	31	3
Total Canada	125	85	9	6
Total Mexico	20	100	-	-

Table 30.--Average annual mortality rates (percent) of adult green-winged teal (for number of birds banded and first-year recovery rate, refer to tables 22, 23 and 24)

Banded in --	Season of banding	Period of banding	Mortality rates		
			Male	Female	All*
Mid-Atlantic States	Winter	1939-61	54.1	--	57.3
North-Central	Summer	1936-61	58.1	--	56.4
Saskatchewan and northern Alberta	Summer	1946-61	52.9	50.1	53.4
Alberta	Summer	1939-61	45.4	--	47.0
South-Central	Winter	1916-61	59.7	--	57.5
Oklahoma-northern Texas	Spring	1934-58	48.4	--	48.7
Kansas	Spring	1925-57	59.5	52.9	58.0
Missouri	Spring	1950-56	51.8	--	63.6
Alaska	Summer	1948-61	58.5	--	67.2
Rocky Mountains	Summer	1927-61	47.0	--	57.5
Puget Sound	Winter	1932-61	45.5	50.7	48.4
	Spring	1933-36	50.9	58.0	53.3
Interior Oregon	Spring	1930-57	61.9	59.3	60.2
Salt Lake Valley	Summer	1926-61	51.2	51.3	51.2
Nevada	Spring	1959-61	57.8	--	61.4
Central Valley	Summer	1930-61	66.3	--	65.1
	Winter	1928-61	56.5	56.0	57.9
	Spring	1948-56	48.4	--	48.8
Imperial Valley	Summer	1950-59	69.3	--	70.9
	Winter	1950-61	59.6	64.3	60.3
	Spring	1948-60	58.7	67.6	60.7

*Includes birds of unknown sex.

Table 31.--Average mortality rates (percent) of green-winged teal banded as immatures, juveniles or
adults (see table 22 for first-year recovery rates)

Banded in --	Number banded	Period of banding	Mortality rates						Average annual
			First year			Adult		All*	
			Male	Female	All*	Male	Female		
Maritimes	426	1942-61	--	--	79.0	--	--	47.5	71.7
Baie Johan Beetz	1,491	1947-61	75.1	70.1	73.5	50.7	62.3	56.7	64.7
Western Lake Ontario	379	1955-61	--	--	65.9	--	--	52.5	62.6
Manitoba	770	1938-61	78.9	71.7	75.0	55.8	60.5	58.5	70.1
Minnesota	934	1942-61	69.0	61.6	67.9	24.1	63.3	40.9	57.3
Saskatchewan and northern Alberta	1,718	1940-61	61.5	53.9	59.8	86.2	47.0	59.5	59.7
Alberta	1,798	1927-61	64.6	69.3	65.9	53.7	25.9	34.1	50.1
Rocky Mountains	1,000	1927-61	66.5	63.2	66.8	47.9	62.2	47.5	59.9
Alaska	585	1948-61	--	--	76.4	--	--	45.3	64.9
Puget Sound	855	1948-61	70.5	88.5	78.8	40.9	23.7	33.3	62.2
Central Valley	592	1930-61	68.4	--	73.1	40.5	--	50.8	62.0
Salt Lake Valley	390	1926-61	--	--	60.0	--	--	65.7	62.2
Imperial Valley	690	1950-59	64.2	79.9	70.2	73.1	56.2	68.9	69.8

*Includes birds of unknown sex.

Table 32.--First-year recovery rates and mortality rates of green-winged teal banded during the summer

Banded in --	Period of banding	Age when banded	Number banded	First-year recovery rates	Mortality rates	
					Immature	Adult
Maritimes	1942-61	Immature	426	8.0	79.0	--
Baie Johan Beetz	1947-53	Immature	913	7.2	72.1	--
	1958-61	Immature	558	5.4	82.0	--
Eastern Lake Ontario	1955-61	Immature	191	10.5	93.5	--
Western Lake Ontario	1955-61	Immature	379	5.3	65.9	--
Manitoba	1948-53	Immature	395	9.6	79.3	--
Minnesota	1955-58	Immature	305	12.5	80.7	--
	1959-61	Immature	583	4.6	63.9	--
	1935-61	Adult	1,577	3.6	--	56.4
Saskatchewan and northern Alberta	1952-58	Immature	592	3.9	67.8	--
	1949-51	Adult	2,058	2.1	--	48.0
	1952-58	Adult	9,429	2.9	--	55.8
Alberta	1951-56	Immature	560	3.6	69.2	--
	1948-50	Adult	1,000	2.1	--	42.6
	1951-56	Adult	491	3.7	--	54.9
	1957-58	Adult	715	2.4	--	59.5
Rocky Mountains	1948-53	Immature	232	6.0	70.0	--
	1956-58	Immature	299	7.0	72.4	--
	1959-61	Immature	412	5.1	64.7	--
	1958-61	Adult	584	5.0	--	62.0
Puget Sound	1957-58	Immature	309	13.9	87.7	--
	1959-61	Immature	411	11.9	84.3	--
	1958-61	Adult	353	9.9	--	69.4
Alaska	1948-51	Immature	291	6.9	73.6	--
	1959-61	Adult	562	3.7	--	69.4
Central Valley	1951-56	Immature	269	8.9	70.6	--
	1951-56	Adult	144	8.3	--	54.5

Table 32.--First-year recovery rates and mortality rates of green-winged teal banded during the summer--continued

Banded in --	Period of banding	Age when banded	Number banded	First-year recovery rates		Mortality rates	
						Immature	Adult
Salt Lake Valley	1926-61	Immature	390	3.6		60.0	--
	1926-35	Adult	715	4.9		--	58.5
	1947-61	Adult	745	1.7		--	38.2
Imperial Valley	1955-56	Immature	247	10.5		70.2	--
	1957-58	Immature	332	4.2		70.0	--
	1955-59	Adult	500	11.6		--	83.7

Table 33.--Age ratios (immature per adult) in the harvest of green-winged teal, 1960-63

Killed in --	Immatures per adult				Sample size			
	1960	1961	1962	1963	1960	1961	1962	1963
<u>Atlantic Flyway</u>								
Maine	4.74	2.15	2.45	4.25	255	124	147	222
Vermont	1.54	7.66	1.59	4.35	51	38	73	56
New Hampshire	7.05	1.67	10.00	10.78	20	8	23	23
Massachusetts	4.14	1.66	1.59	2.73	67	45	54	65
Connecticut	3.20	2.75	1.43	8.30	25	15	59	47
Rhode Island	1.54	3.82	--	6.77	12	4	--	13
New York	2.56	2.19	1.61	7.80	79	93	71	97
Pennsylvania	3.85	0.86	1.73	5.80	32	11	35	47
West Virginia	--	--	1.50	1.04	1	1	5	2
New Jersey	1.32	1.16	0.62	1.72	118	85	135	196
Delaware	1.66	2.43	0.41	1.68	63	83	48	134
Maryland	2.41	4.09	0.99	2.26	27	11	34	85
Virginia	2.80	1.08	0.66	1.79	75	32	36	34
North Carolina	1.38	1.29	0.80	1.49	116	34	53	54
South Carolina	1.92	0.78	1.41	1.68	21	13	28	42
Georgia	--	--	0.44	8.73	4	--	8	11
Florida	2.02	0.95	1.35	2.64	64	45	93	221
Weighted average	2.52	1.69	1.29	2.89				
Total wings					1,030	642	902	1,349
<u>Mississippi Flyway</u>								
Minnesota	4.98	4.30	3.37	3.51	178	175	249	304
Wisconsin	4.16	3.48	3.36	2.15	186	152	247	259
Michigan	5.45	2.21	3.25	4.16	80	88	150	153
Iowa	4.30	4.67	2.11	1.99	114	110	75	160
Illinois	1.97	1.44	2.29	3.20	103	82	78	98
Indiana	1.10	1.25	2.10	2.02	14	22	33	54
Ohio	6.84	7.30	3.59	2.98	61	43	92	65
Missouri	2.28	3.76	6.00	1.85	38	55	45	72
Kentucky	0.85	2.13	1.00	1.10	10	3	4	11
Arkansas	1.94	0.55	1.41	2.55	45	6	17	46
Tennessee	1.85	3.26	--	1.17	26	15	--	42
Louisiana	1.86	1.44	0.85	1.74	79	43	186	194
Mississippi	3.60	0.54	1.49	3.60	24	13	18	48
Alabama	2.76	7.93	1.29	1.42	31	7	22	95
Weighted average	3.69	3.22	2.54	2.44				
Total wings					989	814	1,216	1,601

Table 33.--Age ratios (immature per adult) in the harvest of green-winged teal, 1960-63--continued

Killed in --	Immatures per adult				Sample size			
	1960	1961	1962	1963	1960	1961	1962	1963
<u>Central Flyway</u>								
Montana	--	15.66	7.13	5.20	--	68	35	57
North Dakota	--	4.12	2.29	2.03	--	34	68	124
South Dakota	--	3.54	2.80	2.62	--	16	54	304
Wyoming	--	--	4.49	3.75	--	3	23	37
Nebraska	--	3.69	3.82	4.26	--	69	53	203
Colorado	--	1.54	0.78	2.21	--	95	82	206
Kansas	--	3.93	1.67	2.94	--	357	246	266
New Mexico	--	1.90	1.08	2.38	--	55	25	82
Oklahoma	--	2.73	1.97	3.08	--	43	104	150
Texas	--	1.51	1.37	2.17	--	137	337	293
Weighted average	--	2.96	1.70	2.68				
Total wings					--	877	1,027	1,722
<u>Pacific Flyway</u>								
Washington	--	2.55	2.51	3.06	--	173	332	445
Oregon	--	2.35	1.89	2.37	--	146	190	294
Idaho	--	2.37	1.50	3.96	--	62	90	142
California	--	0.63	0.71	1.02	--	560	728	1,271
Nevada	--	0.81	1.60	2.49	--	60	65	177
Utah	--	0.53	0.43	1.56	--	139	278	332
Arizona	--	0.57	1.14	2.58	--	25	73	125
Weighted average	--	1.17	1.03	1.43				
Total wings					--	1,165	1,756	2,786
U.S. weighted average	--	1.84	1.34	1.91				
U.S. total wings					2,019	3,498	4,901	7,458

Table 34.--Age ratios of green-winged teal caught in banding traps

Banding area	Period of banding	Number in traps		Age ratio Immature:adult
		Immatures	Adults	
Maritimes	Summer	387	43	9.0
Newfoundland	September	745	39	19.1
	October	432	43	10.0
Quebec	Summer	1,478	223	6.6
	September	1,892	184	10.0
	October	470	90	5.2
Mid-Atlantic States	October	98	76	1.3
Eastern Lake Ontario	Summer	221	77	2.9
Western Lake Ontario	Summer	379	99	3.8
Manitoba	Summer	758	398	1.9
	September	300	48	6.2
	October	435	55	7.9
Minnesota	Summer	921	155	5.9
	October	678	104	6.1
Missouri	October	206	223	0.9
Saskatchewan	September	177	80	2.2
Northern Alberta	Summer	458	106	4.3
	September	292	16	18.2
Mackenzie	Summer	223	14	15.9
	September	298	9	33.1
Central Montana	Summer	729	426	1.7
Puget Sound	Summer	716	142	5.0
	October	444	93	4.7
	November	69	73	0.9
Central Washington	Summer	590	421	1.4
Idaho	October	543	348	1.5
Central California	Summer	296	398	0.7
	October	113	81	1.3

Table 34.--Age ratios of green-winged teal caught in banding traps--con.

Banding area	Period of banding	Number in traps		Age ratio Immature:adult
		Immatures	Adults	
Utah	Summer	351	745	0.5
Imperial Valley	Summer	690	547	1.2
	October	125	125	1.0
Colorado - New Mexico	October	175	188	0.9
Texas	October	17	278	0.1

Table 35.--Age ratios (immature per adult) in the harvest of green-winged teal by months of the hunting season for States from which at least 20 wings were received

Killed in --	October		November		December		January	
	1961	1962	1961	1962	1961	1962	1962	1963
<u>Atlantic Flyway</u>								
Maine	1.6	2.5	6.7	--	--	--	--	--
New York	2.2	1.9	--	--	--	--	--	--
New Jersey	--	--	0.7	0.5	1.8	0.9	--	--
Delaware	--	--	2.1	0.5	--	--	--	--
Virginia	--	--	1.2	0.5	--	--	--	--
North Carolina	--	--	--	0.8	1.5	0.8	--	--
Florida	--	--	1.8	1.7	1.1	1.1	--	--
<u>Mississippi Flyway</u>								
Minnesota	3.8	3.6	--	2.4	--	--	--	--
Wisconsin	2.9	3.6	--	2.4	--	--	--	--
Iowa	4.3	2.0	3.6	3.5	--	--	--	--
Illinois	1.0	1.6	1.2	3.1	--	--	--	--
Ohio	3.2	2.2	--	4.5	--	--	--	--
Missouri	--	--	4.0	4.6	--	--	--	--
Louisiana	--	0.4	1.3	0.9	--	--	--	--
<u>Central Flyway</u>								
Montana	10.8	5.7	--	--	--	--	--	--
North Dakota	4.0	2.6	--	--	--	--	--	--
South Dakota	--	2.4	--	2.6	--	--	--	--
Nebraska	3.4	3.7	2.3	--	--	--	--	--
Colorado	--	--	1.6	1.0	3.0	--	--	--
Kansas	2.3	--	4.9	1.8	--	--	--	--
Oklahoma	--	--	2.8	1.9	--	2.2	--	--
Texas	--	--	1.6	--	1.4	1.4	--	--
<u>Pacific Flyway</u>								
Washington	3.9	3.8	1.6	2.1	1.6	1.3	--	--
Oregon	1.4	3.0	1.6	1.6	1.4	1.5	--	1.5
Idaho	3.1	3.2	3.5	1.7	--	1.1	--	0.3
California	0.9	0.5	0.5	1.1	0.5	0.7	0.5	0.7
Nevada	1.4	1.4	--	--	--	--	--	--
Utah	0.5	0.5	0.8	0.4	--	0.4	--	--
Arizona	--	2.1	--	1.5	--	1.2	--	--

Table 36.--Sex ratios (males per female) in the harvest of adult green-winged teal, 1960-63

Killed in --	Males per female				Sample size			
	1960	1961	1962	1963	1960	1961	1962	1963
<u>Atlantic Flyway</u>								
Maine	1.06	1.01	0.82	1.04	46	39	42	40
Vermont	2.62	--	0.50	0.22	15	4	28	7
New Hampshire	--	--	--	1.00	3	3	2	2
Massachusetts	1.69	0.60	0.27	0.23	13	16	28	18
Connecticut	2.00	3.00	0.46	1.50	6	4	24	5
Rhode Island	--	--	--	--	1	1	2	4
New York	0.95	0.78	0.39	0.36	20	28	26	12
Pennsylvania	0.87	1.00	0.81	1.04	6	6	12	6
West Virginia	--	--	1.00	--	0	0	2	1
New Jersey	2.90	2.91	1.28	1.43	53	42	84	74
Delaware	3.94	1.13	2.39	1.52	23	25	34	48
Maryland	--	--	1.82	3.44	9	2	17	23
Virginia	3.66	4.13	3.61	4.77	19	15	22	12
North Carolina	2.68	2.40	4.81	5.09	50	12	29	22
South Carolina	1.54	1.47	2.18	2.47	7	8	12	16
Georgia	--	--	1.30	--	0	0	6	1
Florida	0.75	0.34	0.75	1.04	20	19	41	59
Weighted average	1.67	0.99	1.01	1.31				
Total wings					291	224	411	350
<u>Mississippi Flyway</u>								
Minnesota	0.44	1.07	0.46	0.49	32	38	56	68
Wisconsin	0.71	1.22	0.49	0.39	35	45	54	73
Michigan	0.72	1.52	0.76	0.32	21	31	36	30
Iowa	1.05	1.96	2.68	0.81	21	21	22	54
Illinois	6.64	3.43	1.98	3.27	34	37	23	27
Indiana	2.92	6.88	1.57	17.12	6	10	11	22
Ohio	1.24	0.81	0.36	1.45	9	7	25	17
Missouri	6.05	1.46	0.50	0.76	9	11	8	25
Kentucky	1.05	--	1.00	3.87	5	1	2	5
Arkansas	2.85	1.24	2.67	3.31	14	4	7	14
Tennessee	7.41	1.19	--	12.07	9	4	0	16
Louisiana	1.58	1.75	2.29	3.21	27	18	101	70
Mississippi	3.00	5.00	--	--	4	7	4	15
Alabama	2.14	--	1.73	5.33	9	1	9	40
Weighted average	1.20	1.71	1.07	1.02				
Total wings					235	235	358	476

Table 36.--Sex ratios (males per female) in the harvest of adult green-winged teal, 1960-63--continued

Killed in --	Males per female				Sample size			
	1960	1961	1962	1963	1960	1961	1962	1963
<u>Central Flyway</u>								
Montana	--	--	0.35	0.27	--	5	5	11
North Dakota	--	0.59	1.86	2.19	--	7	20	42
South Dakota	--	3.00	1.21	1.41	--	4	15	81
Wyoming	--	--	--	2.00	--	0	4	8
Nebraska	--	1.48	1.76	2.65	--	16	11	35
Colorado	--	1.89	1.17	1.63	--	35	41	63
Kansas	--	2.50	2.74	1.63	--	78	87	66
New Mexico	--	22.50	2.33	2.07	--	17	10	25
Oklahoma	--	1.56	7.23	1.18	--	11	35	42
Texas	--	2.24	3.16	2.62	--	49	141	96
Weighted average	--	2.30	2.37	1.93				
Total wings					--	222	369	469
<u>Pacific Flyway</u>								
Washington	--	0.38	0.39	0.73	--	53	94	111
Oregon	--	0.66	0.51	0.84	--	57	67	85
Idaho	--	0.87	1.21	1.03	--	16	35	26
California	--	3.07	2.31	2.66	--	339	432	644
Nevada	--	0.86	1.34	1.47	--	32	27	51
Utah	--	1.17	1.86	1.59	--	91	190	127
Arizona	--	1.38	3.11	1.66	--	16	30	38
Weighted average	--	1.50	1.57	1.99				
Total wings					--	604	875	1,082
U.S. weighted average	--	1.56	1.48	1.67				
U.S. total wings					526	1,285	2,013	2,377

Table 37.--Sex ratios (males per female) in the harvest of immature green-winged teal, 1960-63

Killed in --	Males per female				Sample size			
	1960	1961	1962	1963	1960	1961	1962	1963
<u>Atlantic Flyway</u>								
Maine	0.84	0.85	0.76	0.50	196	80	105	180
Vermont	0.52	2.17	0.61	0.48	36	33	45	48
New Hampshire	1.94	4.00	0.32	0.39	17	5	21	21
Massachusetts	1.09	0.33	0.52	0.58	53	28	33	46
Connecticut	1.10	0.57	0.89	0.89	17	11	34	42
Rhode Island	0.65	--	--	1.26	11	3	0	11
New York	1.02	0.78	0.47	1.07	56	64	45	84
Pennsylvania	0.69	1.55	1.22	0.88	25	5	23	40
West Virginia	--	--	0.50	--	1	1	3	1
New Jersey	1.03	3.06	1.44	1.26	63	42	51	122
Delaware	1.21	0.91	2.50	1.80	38	56	14	84
Maryland	1.91	1.65	1.14	2.71	16	9	17	62
Virginia	0.76	1.78	1.02	2.00	53	16	14	21
North Carolina	0.89	1.25	0.87	0.29	63	21	22	32
South Carolina	0.76	0.06	0.74	0.72	12	5	16	26
Georgia	3.00	--	1.00	1.06	4	0	2	10
Florida	0.39	0.54	0.91	0.65	44	26	52	159
Weighted average	0.88	0.89	0.76	0.83				
Total wings					705	405	497	989
<u>Mississippi Flyway</u>								
Minnesota	0.67	0.57	0.82	1.25	138	135	189	218
Wisconsin	0.68	0.95	0.93	1.20	133	105	188	177
Michigan	0.37	1.12	0.94	0.93	55	57	111	115
Iowa	0.99	0.60	1.36	1.39	86	87	52	100
Illinois	1.35	0.70	1.17	1.69	66	40	54	69
Indiana	6.12	1.55	1.13	0.64	8	12	22	32
Ohio	0.74	0.92	0.97	1.20	48	32	62	48
Missouri	1.60	1.21	2.06	2.05	28	42	35	47
Kentucky	2.00	--	1.00	1.88	3	1	2	6
Arkansas	1.05	--	2.26	1.69	31	2	10	31
Tennessee	1.42	0.72	--	2.29	17	10	0	25
Louisiana	0.57	0.79	1.04	1.83	46	23	84	123
Mississippi	3.36	0.35	2.83	1.85	20	6	14	32
Alabama	0.92	0.61	3.45	1.79	19	6	13	52
Weighted average	0.75	0.76	1.07	1.31				
Total wings					698	558	836	1,075

Table 37.--Sex ratios (males per female) in the harvest of immature green-winged teal, 1960-63--continued

Killed in --	Males per female				Sample size			
	1960	1961	1962	1963	1960	1961	1962	1963
<u>Central Flyway</u>								
Montana	--	0.55	0.81	0.56	--	62	29	46
North Dakota	--	0.90	1.21	0.65	--	27	46	82
South Dakota	--	0.16	1.50	0.98	--	12	37	223
Wyoming	--	1.50	0.65	1.60	--	3	19	29
Nebraska	--	0.79	0.93	1.25	--	52	41	168
Colorado	--	0.65	0.38	1.01	--	60	41	143
Kansas	--	1.04	1.49	1.12	--	264	155	200
New Mexico	--	0.46	0.64	0.81	--	38	15	57
Oklahoma	--	1.14	1.44	0.89	--	31	69	108
Texas	--	1.13	1.28	1.81	--	78	191	197
Weighted average	--	0.87	1.17	1.12				
Total wings					--	627	643	1,253
<u>Pacific Flyway</u>								
Washington	--	0.50	0.58	0.56	--	118	235	334
Oregon	--	0.55	0.68	0.61	--	88	122	209
Idaho	--	0.60	0.58	0.58	--	42	54	116
California	--	0.70	0.71	0.83	--	218	291	622
Nevada	--	0.77	0.91	0.83	--	25	37	126
Utah	--	0.60	0.85	0.96	--	48	85	200
Arizona	--	0.72	1.96	0.90	--	9	43	87
Weighted average	--	0.58	0.69	0.73				
Total wings					--	548	867	1,694
U.S. weighted average	--	0.72	0.84	0.94				
U.S. total wings					1,403	2,138	2,843	5,011

Table 38.--Sex ratios (males per female) in the harvest of adult green-winged teal by months of the hunting season for States from which at least 20 wings were received

Killed in --	October			November			December			January		
	1961	1962	1963	1961	1962	1963	1961	1962	1963	1962	1963	1964
<u>Atlantic Flyway</u>												
Maine	1.0	0.7	1.2	--	--	--	--	--	--	--	--	--
Vermont	--	0.4	--	--	--	--	--	--	--	--	--	--
New York	0.8	0.2	--	--	--	--	--	--	--	--	--	--
New Jersey	--	--	1.1	1.4	1.5	1.2	--	--	--	--	--	--
Delaware	--	--	--	0.9	1.6	1.5	--	--	--	--	--	--
Maryland	--	--	--	--	2.0	--	--	--	--	--	--	--
Florida	--	--	--	--	--	--	--	--	0.9	1.6	--	--
<u>Mississippi Flyway</u>												
Minnesota	0.9	0.6	0.5	--	--	--	--	--	--	--	--	--
Wisconsin	0.7	0.5	0.4	--	--	--	--	--	--	--	--	--
Michigan	2.1	0.9	0.5	--	--	--	--	--	--	--	--	--
Iowa	--	--	1.0	--	--	--	--	--	--	--	--	--
Illinois	2.0	--	--	5.0	--	2.9	--	--	--	--	--	--
Indiana	--	--	--	--	--	6.3	--	--	--	--	--	--
Louisiana	--	--	--	--	--	--	--	--	2.7	4.0	--	--
<u>Central Flyway</u>												
North Dakota	--	--	1.8	--	--	--	--	--	--	--	--	--
South Dakota	--	--	1.3	--	--	1.3	--	--	--	--	--	--
Nebraska	--	--	1.9	--	--	--	--	--	--	--	--	--
Kansas	2.0	--	1.6	2.6	2.2	1.7	--	--	--	--	--	--
Oklahoma	--	--	--	--	2.1	1.2	--	--	2.5	3.4	3.5	--
Texas	--	--	--	--	--	--	--	--	--	--	--	--
<u>Pacific Flyway</u>												
Washington	0.2	0.2	0.6	0.4	0.4	0.6	1.0	0.9	1.1	--	--	--
Oregon	1.0	--	0.5	0.4	--	0.7	--	0.8	1.3	--	--	--
California	2.5	2.6	3.8	2.1	1.7	2.1	3.4	2.2	2.9	3.1	2.1	3.3
Nevada	--	--	1.9	--	--	--	--	--	--	--	--	--
Utah	1.0	1.6	1.2	--	--	1.9	--	--	4.0	--	--	--

Table 39.—Sex ratios (males per female) in the harvest of immature green-winged teal by months of the hunting season for States from which at least 20 wings were received

Killed in --	October			November			December			January		
	1961	1962	1963	1961	1962	1963	1961	1962	1963	1962	1963	1964
<u>Atlantic Flyway</u>												
Maine	1.0	0.7	0.5	0.4	--	--	--	--	--	--	--	--
Vermont	2.4	0.4	0.4	--	--	--	--	--	--	--	--	--
Massachusetts	0.3	0.5	0.5	--	--	0.5	--	--	--	--	--	--
Connecticut	--	0.9	0.5	--	--	--	--	--	--	--	--	--
New York	0.9	0.4	1.1	--	--	--	--	--	--	--	--	--
Pennsylvania	--	--	1.1	--	--	--	--	--	--	--	--	--
New Jersey	2.2	--	1.7	4.5	1.5	1.1	--	--	--	--	--	--
Delaware	--	--	--	0.7	--	1.7	--	--	--	--	--	--
Maryland	--	--	--	--	0.9	2.1	--	--	--	4.0	--	--
Florida	--	--	--	--	--	0.7	--	1.1	0.6	--	1.1	--
<u>Mississippi Flyway</u>												
Minnesota	0.8	0.8	1.2	--	--	1.5	--	--	--	--	--	--
Wisconsin	1.0	0.9	1.1	--	--	--	--	--	--	--	--	--
Michigan	1.0	0.9	0.9	--	--	--	--	--	--	--	--	--
Iowa	0.6	1.5	1.0	--	1.1	9.0	--	--	--	--	--	--
Illinois	--	0.9	--	0.8	1.5	1.9	--	--	--	--	--	--
Indiana	--	--	--	--	1.2	0.6	--	--	--	--	--	--
Ohio	--	0.9	1.4	--	--	--	--	--	--	--	--	--
Missouri	--	--	2.3	0.9	1.9	1.6	--	--	--	--	--	--
Louisiana	--	--	--	0.6	--	1.5	--	1.4	1.7	--	--	--
Mississippi	--	--	--	--	--	--	--	--	1.5	--	--	--
Alabama	--	--	--	--	--	--	--	--	1.9	--	--	--

Table 39.--Sex ratios (males per female) in the harvest of immature green-winged teal by months of the hunting season for States from which at least 20 wings were received--continued

Killed in --	October			November			December			January		
	1961	1962	1963	1961	1962	1963	1961	1962	1963	1962	1963	1964
<u>Central Flyway</u>												
Montana	0.6	0.3	--	--	--	--	--	--	--	--	--	--
North Dakota	0.9	1.0	0.6	--	--	--	--	--	--	--	--	--
South Dakota	--	--	0.9	--	--	1.6	1.3	--	--	--	--	--
Nebraska	1.1	0.9	0.8	--	--	3.4	--	--	--	--	--	--
Colorado	0.7	--	--	0.7	0.5	--	--	--	--	--	--	--
Kansas	0.8	--	0.8	1.2	1.3	1.4	--	--	--	--	--	--
Oklahoma	--	--	--	--	1.2	0.9	1.6	--	1.9	--	--	--
Texas	--	--	--	1.1	--	--	1.2	1.3	1.7	--	--	--
<u>Pacific Flyway</u>												
Washington	0.5	0.6	0.2	0.7	0.5	--	0.6	0.7	--	--	--	--
Oregon	0.6	0.4	0.7	0.9	1.4	0.6	0.8	0.7	0.8	--	--	--
Idaho	0.7	0.6	0.6	--	--	--	--	0.4	--	--	--	--
California	0.4	0.6	1.0	0.6	1.0	0.7	1.2	0.7	0.9	0.7	0.9	1.0
Nevada	--	--	0.8	--	--	0.6	--	--	1.0	--	--	--
Utah	0.5	1.0	0.8	--	--	1.3	--	--	0.9	--	--	--
Arizona	--	--	--	--	--	0.4	--	1.0	1.4	--	--	--

Table 40.--Sex ratios (males per female) in trapped samples of adult green-winged teal (at least 100 teal were captured)

Trapped in --	Period when trapped							
	Summer	Sept.	Oct.	Nov.	Dec.	Jan.	Winter	Spring
Baie Johan Beetz	1.4	0.5	0.1	--	--	--	--	--
Chesapeake and Delaware Bays	--	--	--	--	--	--	2.4	--
North Carolina	--	--	--	--	--	--	3.4	--
Minnesota	0.9	--	0.8	--	--	--	--	--
Missouri	--	--	0.8	3.6	--	--	--	2.6
Louisiana	--	--	--	--	--	--	3.1	1.0
North Dakota, South Dakota and Nebraska	3.2	--	--	--	--	--	--	3.1
Central Montana	0.9	--	--	--	--	--	--	--
Kansas, Oklahoma and Texas	--	--	0.7	--	3.1	--	2.1	2.8
Colorado-Wyoming	2.9	--	0.9	1.6	--	--	1.3	--
Central British Columbia	3.7	--	--	--	--	--	--	--
Central Washington	1.7	--	0.4	1.0	1.0	--	--	--
Coastal Washington	0.6	--	0.3	--	--	--	1.4	--
Coastal Oregon	1.6	--	--	--	0.4	0.6	0.9	--
Interior Oregon	--	--	--	--	--	3.0	2.0	1.7
Salt Lake Valley	1.7	--	--	--	--	--	--	--
Nevada	--	--	--	--	--	--	--	2.0
Central Valley	3.9	--	--	--	1.3	1.2	2.1	1.8
Imperial Valley	3.4	--	1.3	1.1	2.5	2.1	2.7	2.1
Arizona	--	--	--	--	--	2.2	--	--

Table 41.--Sex ratios (males per female) in trapped samples of immature green-winged teal (at least 100 teal were captured)

Trapped in --	Period when trapped			
	Summer	September	October	November
Maritimes	1.0	1.1	0.7	--
Baie Johan Beetz	1.2	1.0	0.6	--
Eastern Lake Ontario	0.9	--	--	--
Western Lake Ontario	0.9	--	--	--
Manitoba	1.0	1.0	1.6	--
Saskatchewan	1.2	--	--	--
Alberta	0.8	0.9	--	--
Mackenzie	1.0	0.9	--	--
Minnesota	1.3	--	1.4	--
Central Montana	0.8	--	--	--
Central Washington	1.2	--	0.5	--
Western Montana	0.9	--	--	--
Alaska	1.1	--	--	--
Puget Sound	1.7	--	1.7	--
Salt Lake Valley	1.4	--	--	--
Central Valley	1.9	--	0.6	0.5
Imperial Valley	1.6	--	1.0	0.8

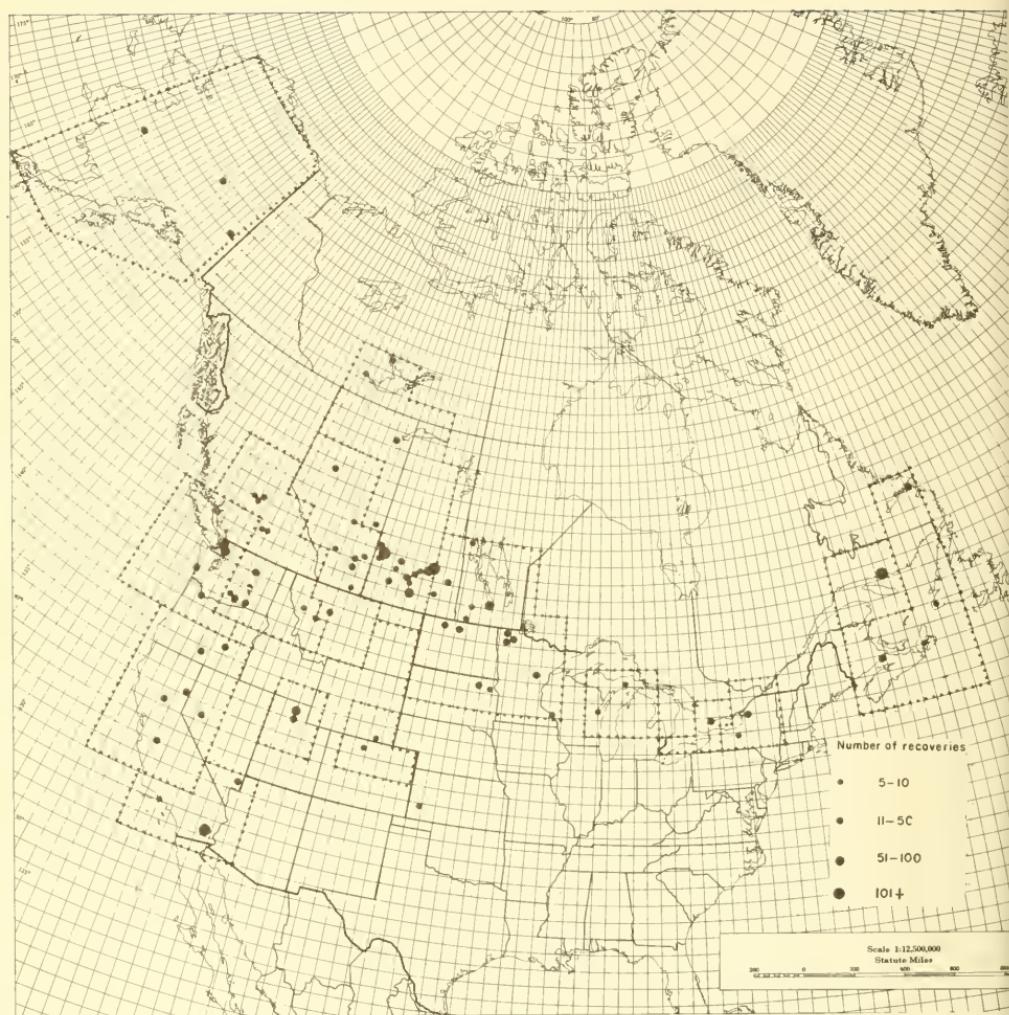


Figure 1.--Locations of summer banding sites from which five or more recoveries were obtained. (Dotted lines inscribe reference areas, fig. 5.)

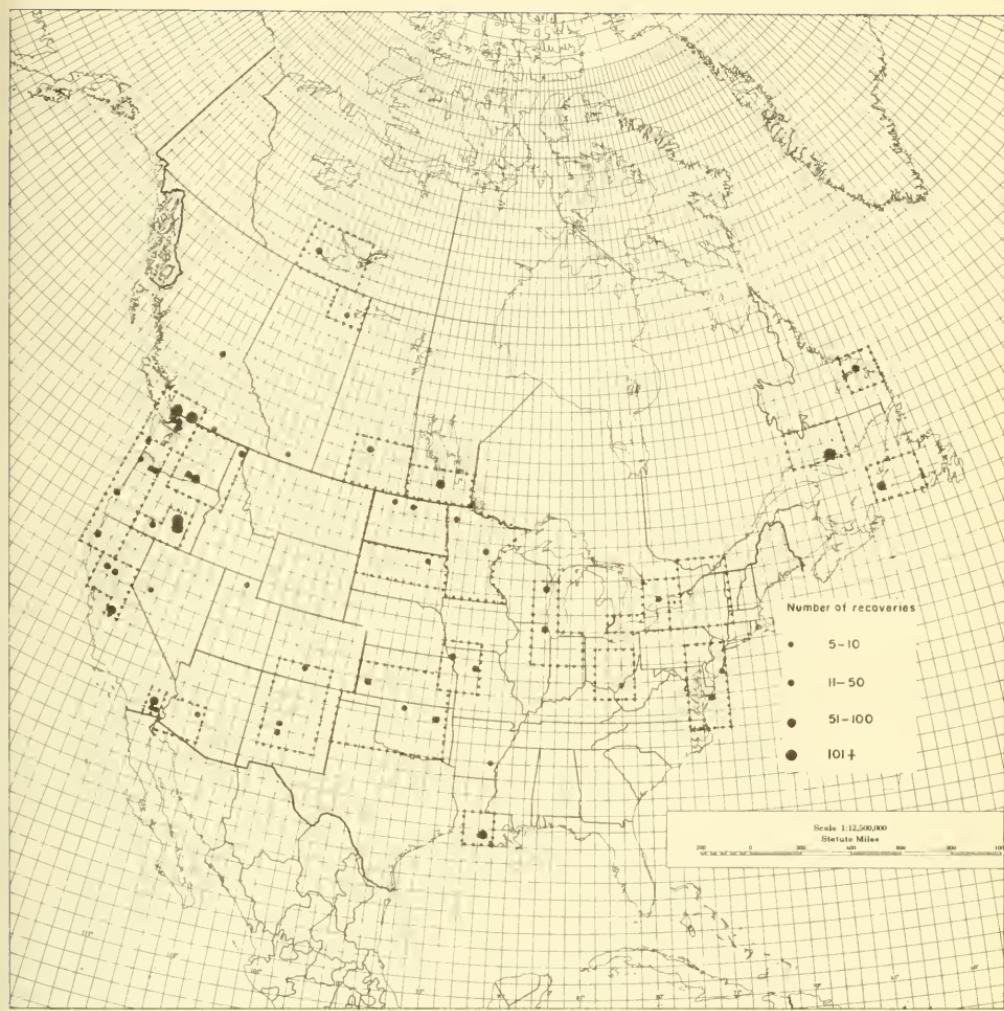
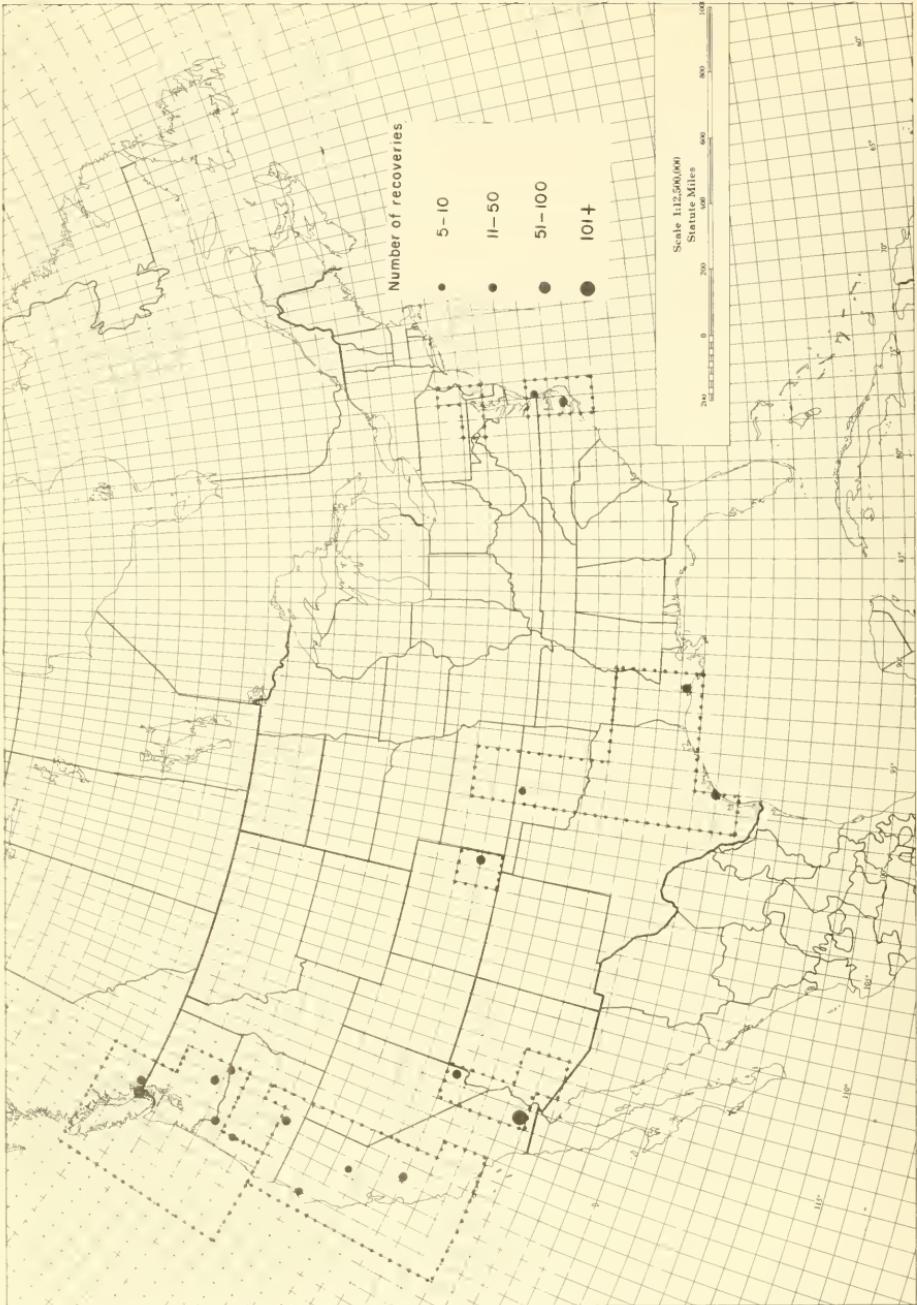


Figure 2.--Locations of fall banding sites from which five or more recoveries were obtained. (Dotted lines inscribe banding sites where birds had similar distribution patterns.)

Figure 3.--Locations of winter banding sites from which five or more recoveries were obtained. (Dotted lines inscribe reference areas, fig. 6).



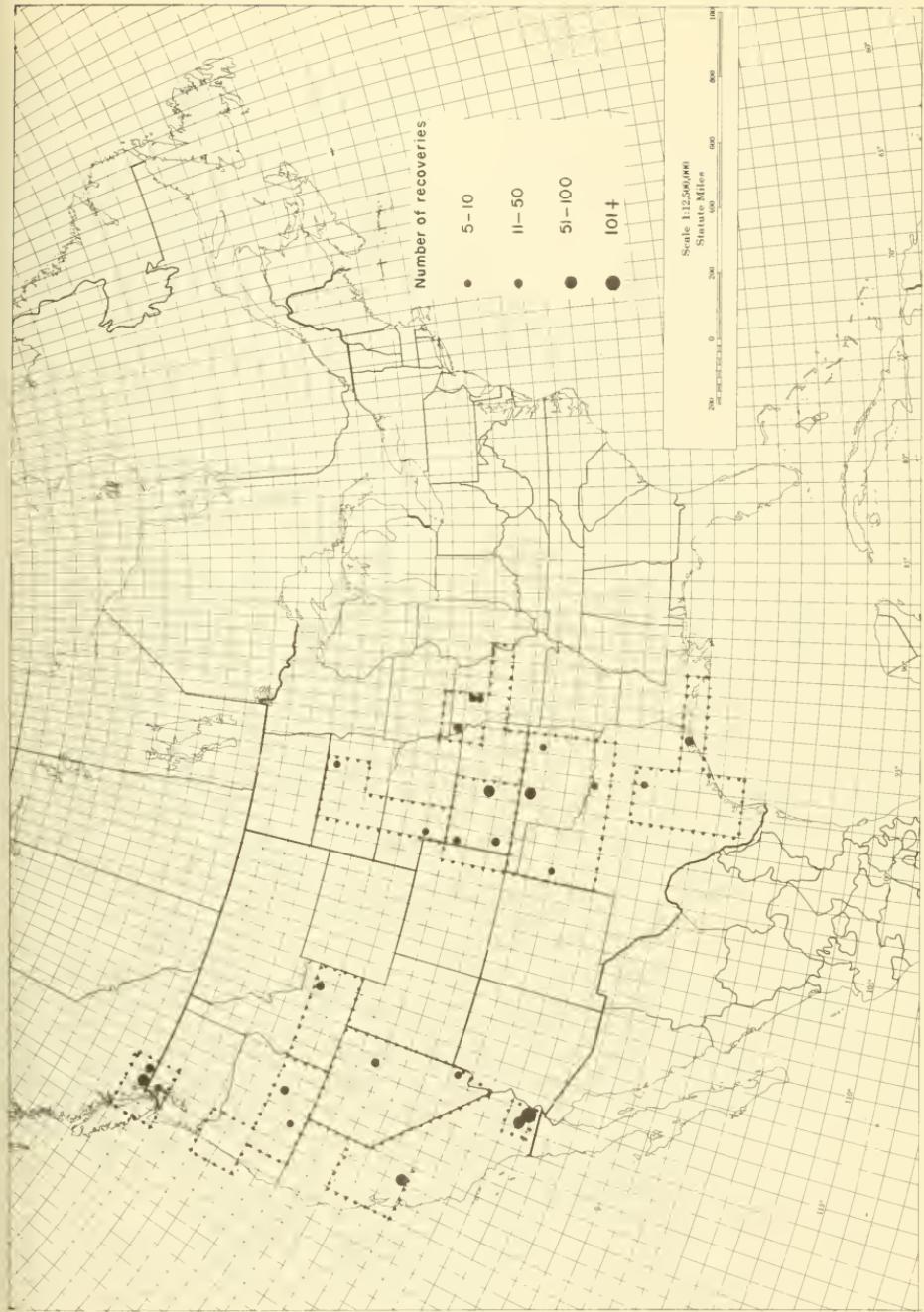


Figure 4.--Locations of spring banding sites from which five or more recoveries were obtained. (Dotted lines inscribe banding sites where birds had similar distribution patterns.)

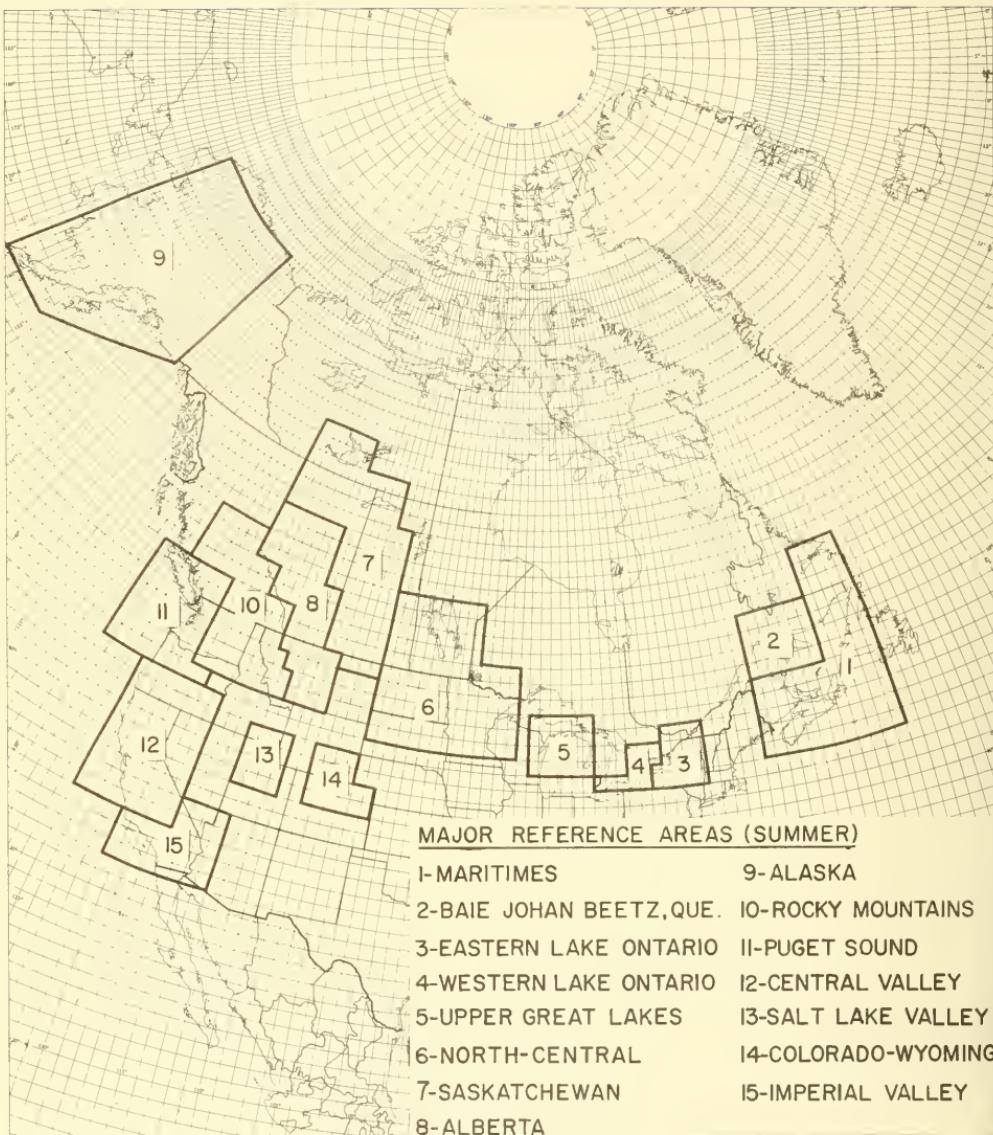
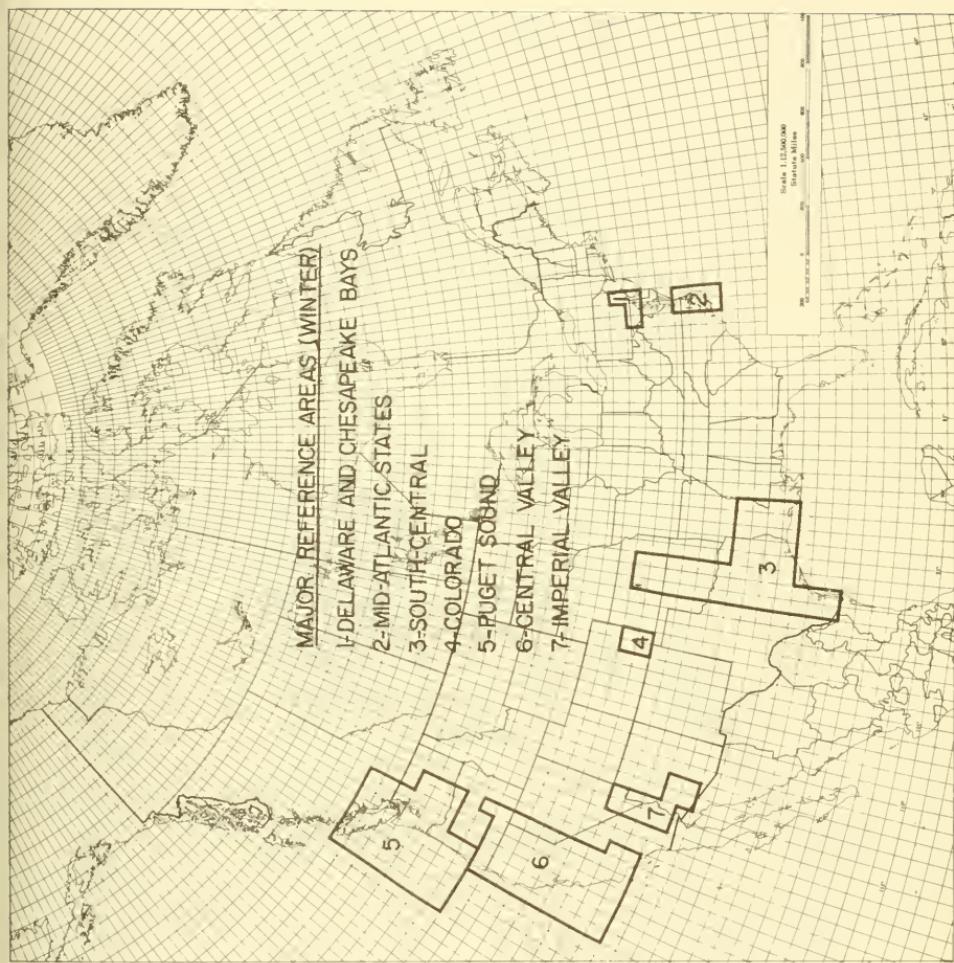


Figure 5.--Green-winged teal summer reference areas of banding.

Figure 6.--Green-winged teal winter reference areas of banding.



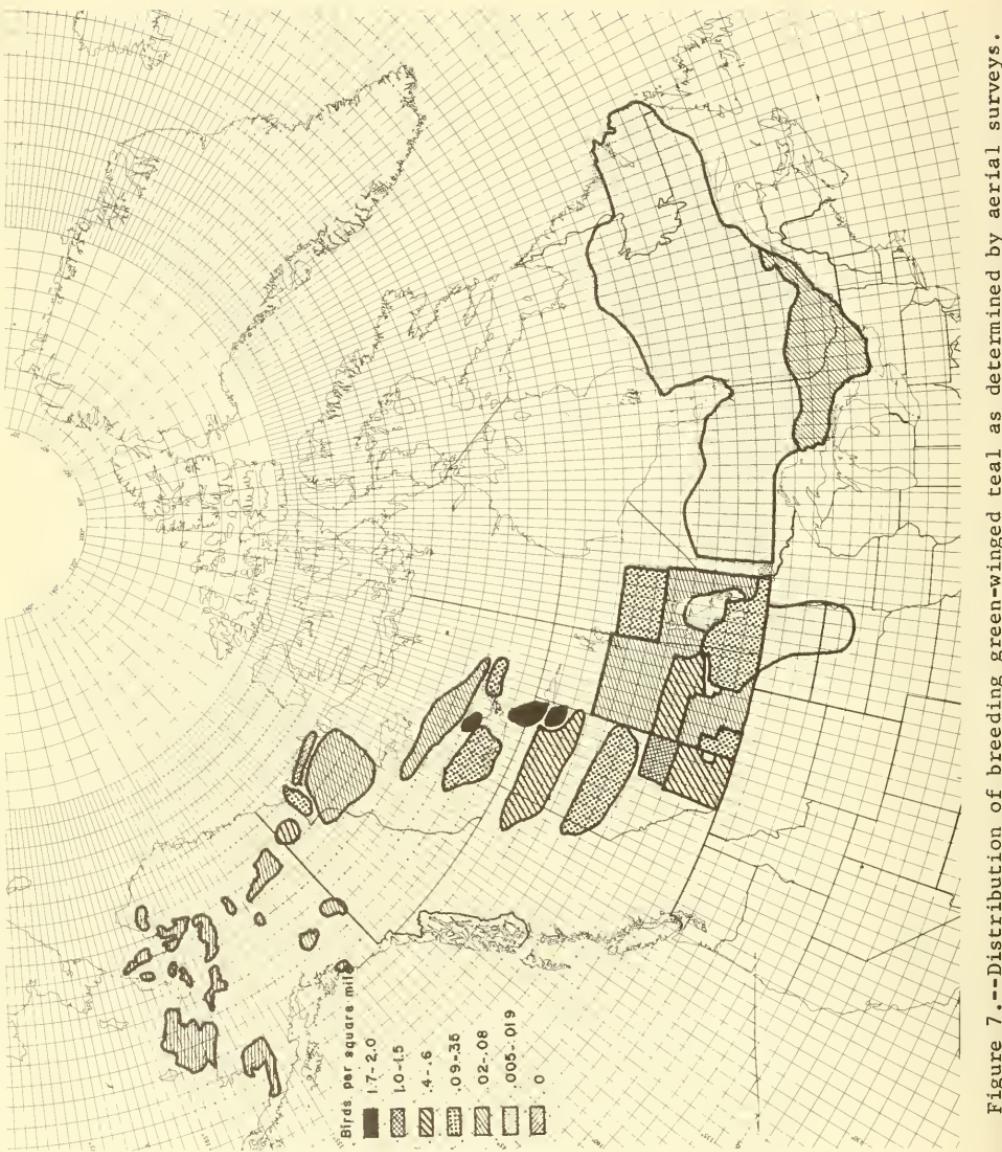


Figure 7.—Distribution of breeding green-winged teal as determined by aerial surveys.

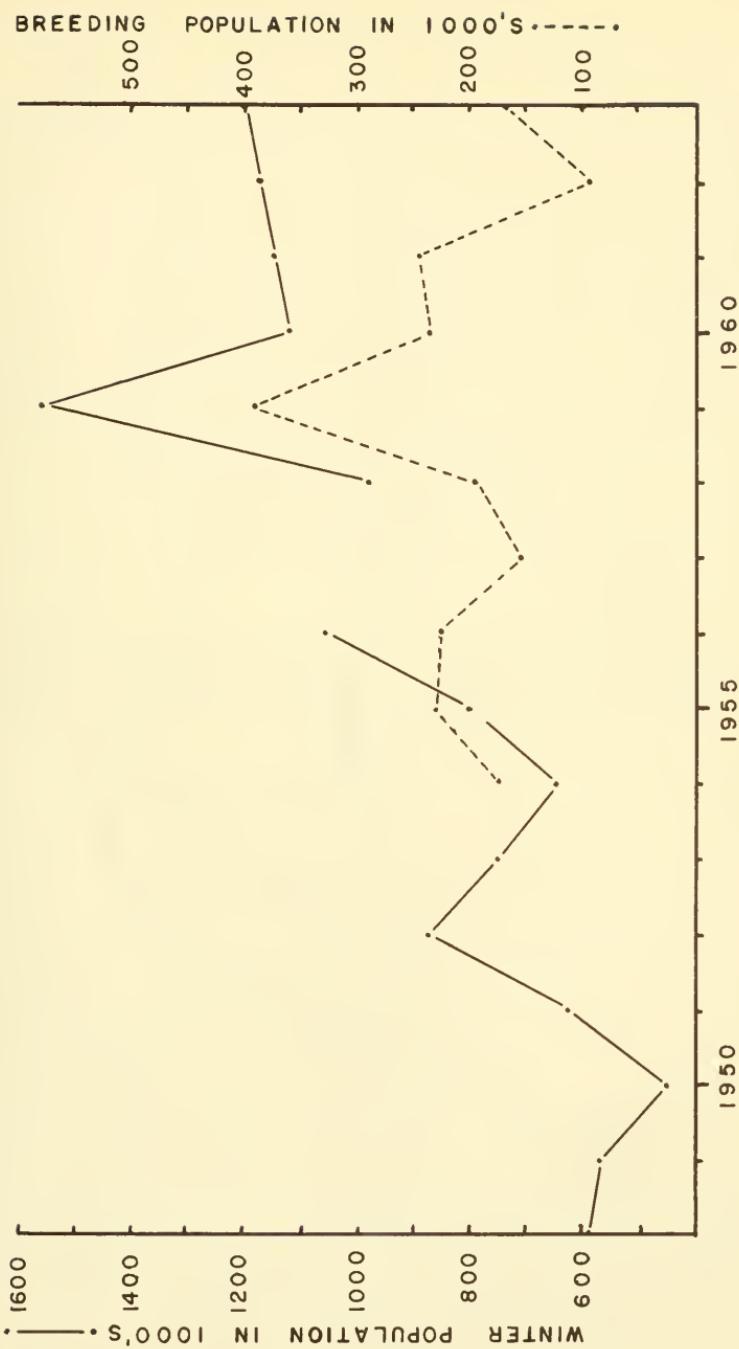


Figure 8.--Breeding and wintering populations of green-winged teal determined from aerial surveys.

northern
limit of
range

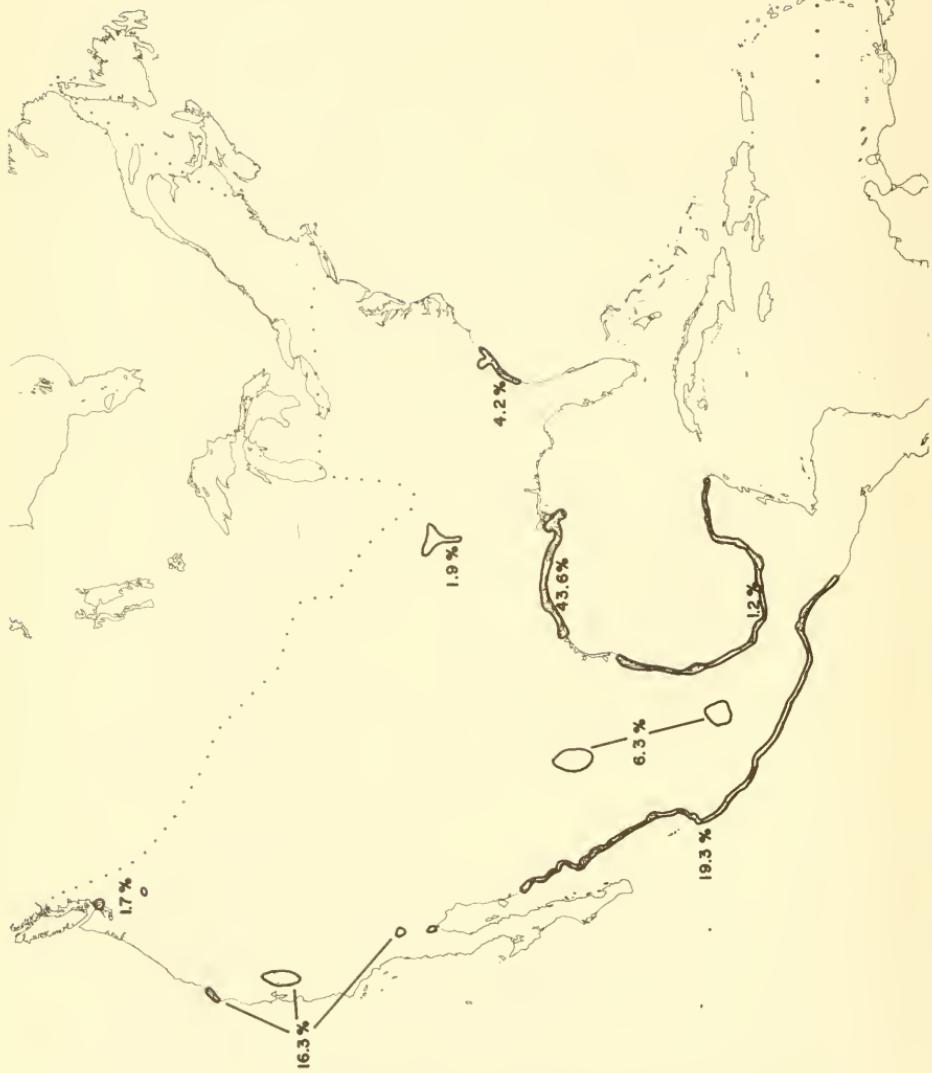


Figure 9.--Areas where more than 1 percent of the green-winged teal winter according to winter survey data.

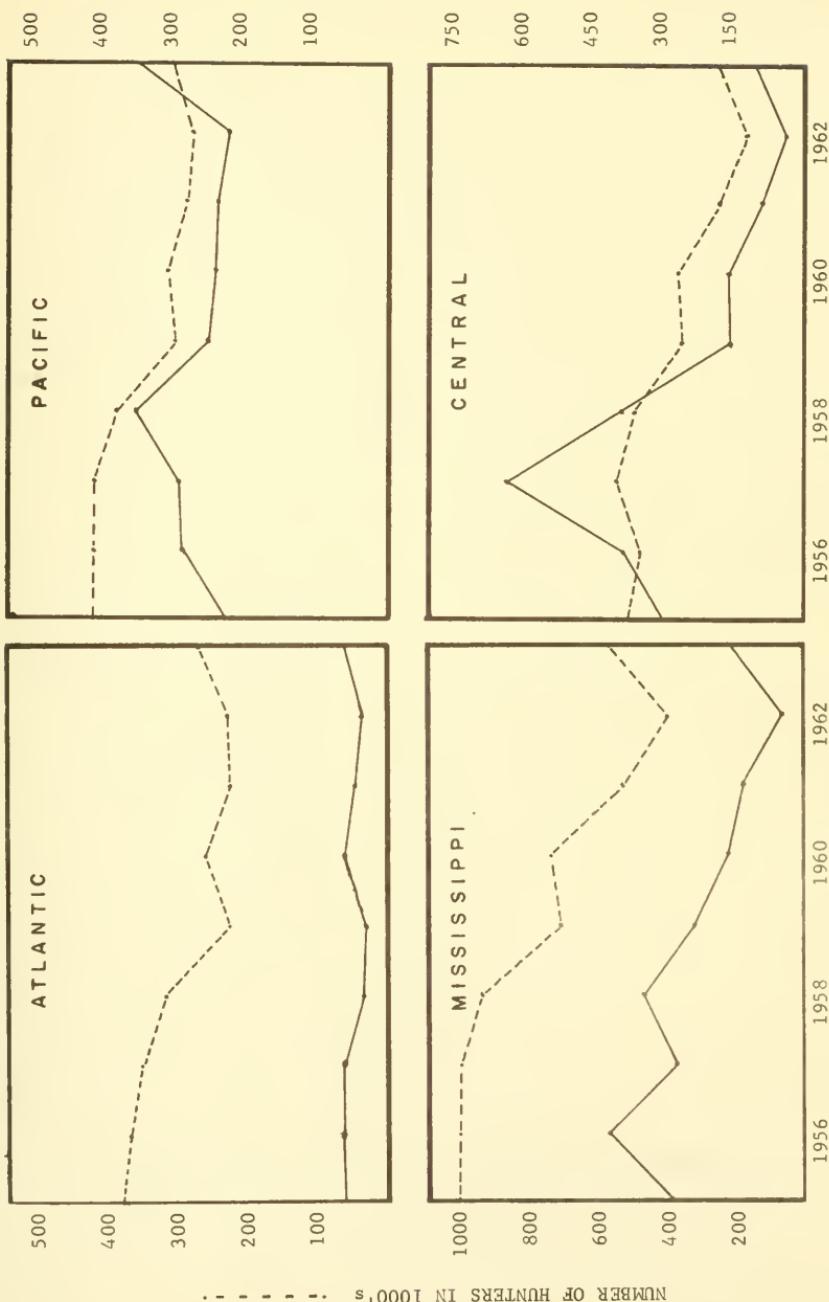


Figure 10.--Comparison between harvest of green-winged teal and number of hunters for each flyway.

Direct recovery rate of adults banded in summer



Figure 11.—Correlation, with fiducial limits ($p = 0.95$), between direct recovery rate (percent) and annual mortality rate (percent) of adult green-winged teal.

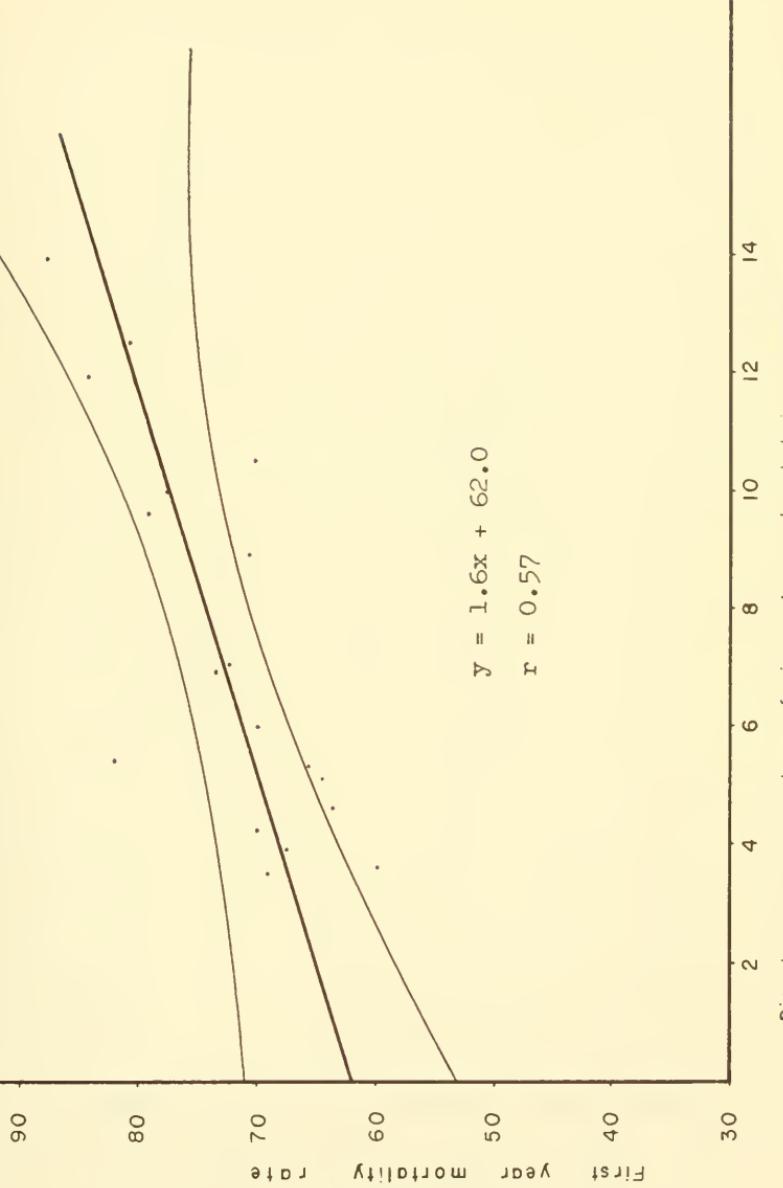


Figure 12.--Correlation, with fiducial limits ($p = 0.95$), between direct recovery rate (percent) and first-year mortality rate (percent) of immature green-winged teal.

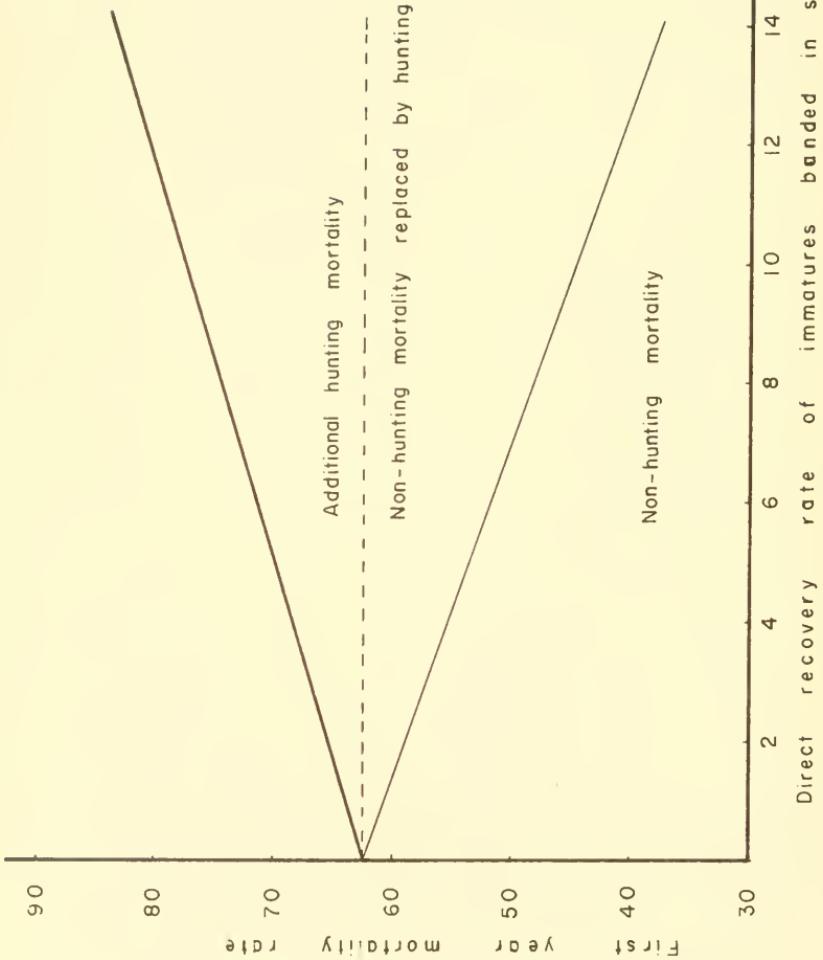


Figure 13.--Relation between hunting and non-hunting mortality in immature green-winged teal.

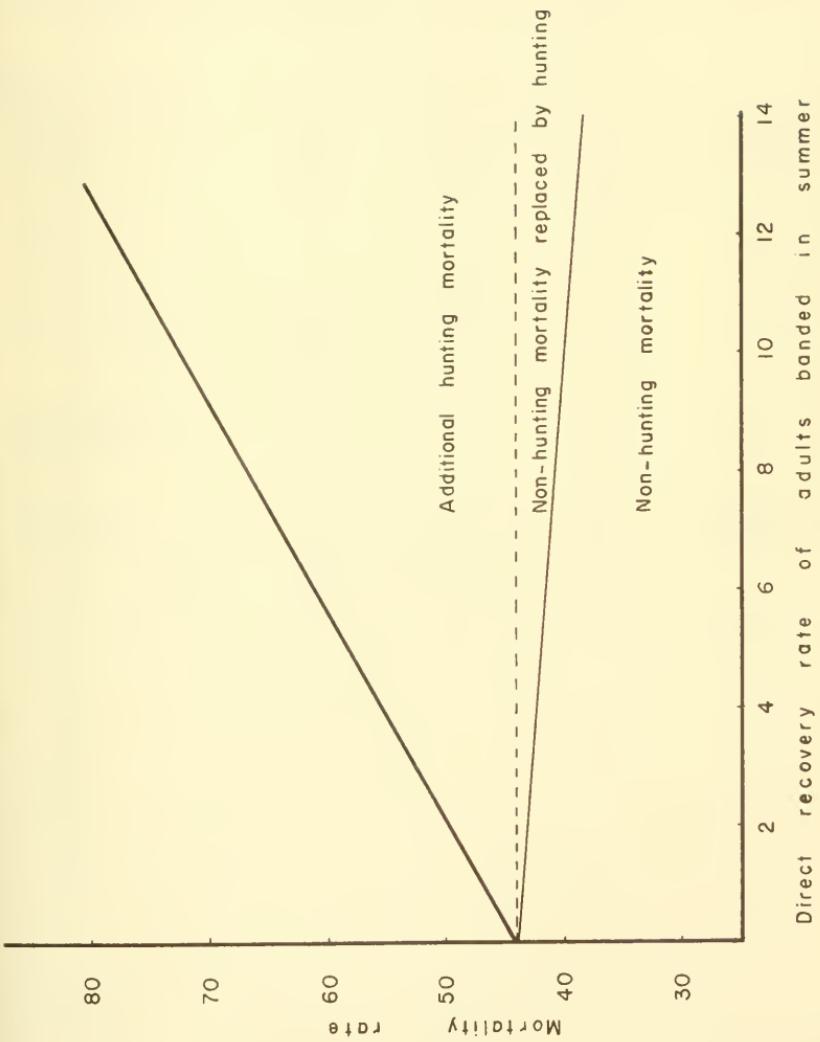


Figure 14.—Relation between hunting and non-hunting mortality in adult green-winged teal.

APPENDIX

A. RECOVERY DISTRIBUTION TABLES

Table A-1.--Recovery distribution (percent) of green-winged teal banded during the summer in the Maritimes reference area, 1946-61

Recovery Location	Minor reference area of banding			Total
	Lab.	Nfld.	N.S., N.B. and P.E.I.	
<u>Canada</u>				
Quebec	7.1	--	3.3	3.9
Labrador	7.1	--	--	2.0
Newfoundland	--	28.6	--	3.9
New Brunswick	14.3	14.3	13.3	13.7
Prince Edward Island	--	14.3	10.0	7.8
Nova Scotia	7.1	--	30.0	19.6
<u>Atlantic Flyway</u>				
Maine	--	14.3	--	2.0
Massachusetts	7.1	--	3.3	3.9
New York	--	--	3.3	2.0
New Jersey	14.3	14.3	10.0	11.8
Delaware	--	--	10.0	5.9
Maryland	7.1	--	3.3	3.9
Virginia	21.4	14.3	3.3	9.8
North Carolina	7.1	--	3.3	3.9
Florida	--	--	6.7	3.9
<u>Mississippi Flyway</u>				
Ohio	7.1	--	--	2.0
Total	99.7	100.1	99.8	100.0
Total recoveries	14	7	30	51

Table A-2.--Recovery distribution (percent) of green-winged teal banded during the summer at Baie Johan Beetz, Quebec, 1947-61

Recovery Location	Adults			Total
	Male	Female	Immature	
<u>Canada</u>				
Ontario	3.5	5.8	1.0	2.1
Quebec	--	23.5	12.2	11.2
Newfoundland	3.5	--	1.0	1.4
New Brunswick	10.7	5.8	18.3	15.4
Prince Edward Island	10.7	11.7	4.1	6.3
Nova Scotia	--	5.8	5.1	4.2
<u>Atlantic Flyway</u>				
Maine	10.7	--	12.2	10.5
Massachusetts	3.5	--	5.1	4.2
New York	7.1	11.7	8.2	8.4
Pennsylvania	--	--	1.0	0.7
New Jersey	--	5.8	3.1	2.8
Delaware	3.5	--	4.1	3.5
Maryland	7.1	--	2.0	2.8
Virginia	--	5.8	1.0	1.4
North Carolina	17.8	11.7	7.1	9.8
South Carolina	3.5	5.8	4.1	4.2
Florida	7.1	--	6.1	5.6
<u>Mississippi Flyway</u>				
Minnesota	7.1	--	--	1.4
Iowa	--	--	1.0	0.7
Arkansas	--	--	1.0	0.7
Louisiana	--	5.8	1.0	1.4
Alabama	3.5	--	1.0	1.4
Total	99.3	99.2	99.7	100.1
Total recoveries	28	17	98	143

Table A-3.--Recovery distribution (percent) of green-winged teal banded during the summer in three major reference areas of the Great Lakes region

Recovery Location	Major reference areas		
	Eastern Lake Ontario	Western Lake Ontario	Upper Great Lakes
<u>Canada</u>			
Ontario	4.2	44.0	--
Quebec	4.2	--	--
Nova Scotia	4.2	--	--
<u>Atlantic Flyway</u>			
Maine	--	--	6.2
Vermont	4.2	--	--
New York	29.2	4.0	--
Pennsylvania	--	4.0	--
New Jersey	4.2	--	--
Delaware	4.2	4.0	--
Maryland	--	4.0	--
Virginia	4.2	--	--
North Carolina	8.3	8.0	--
South Carolina	12.5	--	--
Georgia	--	8.0	--
Florida	8.3	--	--
<u>Mississippi Flyway</u>			
Wisconsin	--	--	50.0
Michigan	4.2	4.0	12.5
Iowa	--	4.0	--
Illinois	--	--	6.2
Ohio	--	4.0	--
Missouri	--	--	6.2
Tennessee	--	4.0	--
Louisiana	4.2	--	18.7
Mississippi	--	4.0	--
<u>Central Flyway</u>			
Kansas	4.2	--	--
<u>Mexico</u>			
Total	100.3	100.0	99.8
Total recoveries	24	25	16

Table A-4.--Recovery distribution (percent) of green-winged teal banded during the summer in Manitoba, 1946-54

Recovery Location	Adults	Immatures and Locals	Total
<u>Canada</u>			
Ontario	--	2.0	1.2
Manitoba	5.7	30.0	20.0
<u>Mississippi Flyway</u>			
Minnesota	14.3	10.0	11.8
Wisconsin	--	2.0	1.2
Iowa	2.9	--	1.2
Illinois	5.7	--	2.4
Missouri	--	10.0	5.9
Arkansas	2.9	--	1.2
Louisiana	25.7	12.0	17.6
<u>Central Flyway</u>			
North Dakota	14.3	4.0	8.2
South Dakota	2.9	8.0	5.9
Nebraska	2.9	--	1.2
Kansas	--	4.0	2.4
Oklahoma	--	4.0	2.4
Texas	14.3	12.0	12.9
<u>Pacific Flyway</u>			
California	8.6	2.0	4.7
Total	100.2	100.0	100.2
Total recoveries	35	50	85

Table A-5.--Recovery distribution (percent) of green-winged teal banded during the summer in Minnesota, 1955-61

Recovery Location	Adults	Immatures	Total
<u>Canada</u>			
Ontario	2.6	--	0.9
Manitoba	2.6	1.4	1.8
Saskatchewan	2.6	--	0.9
<u>Atlantic Flyway</u>			
North Carolina	2.6	--	0.9
Virginia	2.6	--	0.9
<u>Mississippi Flyway</u>			
Minnesota	28.9	54.3	45.4
Wisconsin	--	2.9	1.8
Michigan	2.6	--	0.9
Iowa	2.6	5.7	4.6
Illinois	7.9	2.9	4.6
Missouri	2.6	5.7	4.6
Arkansas	--	2.9	1.8
Louisiana	7.9	7.1	7.4
Mississippi	--	1.4	0.9
<u>Central Flyway</u>			
North Dakota	--	1.4	0.9
South Dakota	--	1.4	0.9
Nebraska	2.6	--	0.9
Kansas	10.5	5.7	7.4
Oklahoma	--	1.4	0.9
Texas	10.5	5.7	7.4
<u>Pacific Flyway</u>			
Washington	2.6	--	0.9
California	7.9	--	2.8
Total	99.6	99.9	99.5
Total recoveries	38	70	108

Table A-6.--Recovery distribution (percent) from preseason banding in three minor areas of the North Central major reference area

Recovery Location	Southeastern Saskatchewan (1929-61)	North Dakota (1932-61)	South Dakota (1937-61)
<u>Canada</u>			
Ontario	2.9	--	--
Saskatchewan	2.9	--	5.3
Alberta	--	--	5.3
<u>Mississippi Flyway</u>			
Minnesota	2.9	11.9	21.1
Iowa	--	7.1	--
Illinois	2.9	--	10.5
Missouri	2.9	2.4	--
Arkansas	2.9	2.4	5.3
Louisiana	14.3	11.9	10.5
Mississippi	--	2.4	5.3
<u>Central Flyway</u>			
North Dakota	8.6	4.8	--
South Dakota	8.6	2.4	15.8
Wyoming	2.9	--	--
Nebraska	2.9	7.1	10.5
Colorado	--	2.4	--
Kansas	8.6	14.3	5.3
Oklahoma	5.7	--	--
Texas	14.3	19.0	5.3
<u>Pacific Flyway</u>			
California	5.7	7.1	--
Nevada	2.9	--	--
Utah	8.6	2.4	--
<u>Mexico</u>			
Total	100.5	100.0	100.2
Total recoveries	35	42	19

Table A-7.--Recovery distribution (percent) of green-winged teal banded during the summer in Saskatchewan, 1937-61

Recovery Location	Adults		Immature and Locals	Total
	Male	Female		
<u>Canada</u>				
Quebec	0.2	--	--	0.2
Manitoba	0.4	--	--	0.3
Saskatchewan	0.4	4.8	4.8	0.8
British Columbia	0.2	--	--	0.2
Mackenzie	--	2.4	--	0.2
<u>Atlantic Flyway</u>				
New Jersey	0.2	--	--	0.2
South Carolina	0.2	--	--	0.2
<u>Mississippi Flyway</u>				
Minnesota	2.9	--	4.8	2.8
Wisconsin	0.5	--	--	0.5
Michigan	0.5	--	--	0.5
Iowa	1.1	2.4	9.5	1.5
Illinois	2.0	--	--	1.8
Indiana	0.2	--	--	0.2
Missouri	1.5	2.4	--	1.5
Arkansas	2.7	2.4	4.8	2.0
Tennessee	0.4	--	--	0.3
Louisiana	8.7	7.1	4.8	8.5
Mississippi	0.4	--	--	0.3
<u>Central Flyway</u>				
Montana	0.4	--	--	0.2
North Dakota	1.3	2.4	--	1.3
South Dakota	1.1	4.8	--	1.3
Nebraska	3.8	2.4	4.8	3.7
Colorado	0.7	--	--	0.5
Kansas	4.7	2.4	9.5	4.7
New Mexico	0.2	--	4.8	0.2
Oklahoma	2.2	2.4	--	2.1
Texas	20.5	16.7	38.1	20.8
<u>Pacific Flyway</u>				
Idaho	0.9	2.4	--	0.8
California	31.8	31.0	4.8	30.8
Nevada	2.0	2.4	--	2.0
Utah	6.9	4.8	4.8	6.7
Arizona	0.4	--	--	0.3
<u>Mexico</u>	0.9	7.1	4.8	1.5
Total	100.3	100.3	100.3	99.7
Total recoveries	551	42	21	614

Table A-8.--Recovery distribution (percent) of green-winged teal banded during the summer in northern Alberta and the Mackenzie District

Recovery Location	Northern Alberta (1946-61)	Mackenzie District (1955-61)
<u>Canada</u>		
Saskatchewan	4.0	--
Alberta	8.0	8.3
<u>Mississippi Flyway</u>		
Minnesota	8.0	--
Missouri	4.0	--
Louisiana	12.0	8.3
<u>Central Flyway</u>		
North Dakota	4.0	8.3
South Dakota	4.0	8.3
Nebraska	--	8.3
Kansas	8.0	8.3
Oklahoma	8.0	8.3
Texas	20.0	25.0
<u>Pacific Flyway</u>		
Oregon	--	8.3
California	12.0	--
Utah	4.0	--
<u>Mexico</u>	4.0	--
Total	100.0	99.7
Total recoveries	25	12

Table A-9.--Recovery distribution (percent) of green-winged teal banded during the summer in the Alberta - Montana major reference area, 1938-61

Recovery Location	Alberta (1938-61)	Central Montana (1959-60)
<u>Canada</u>		
Saskatchewan	0.5	--
Alberta	2.2	--
<u>Mississippi Flyway</u>		
Minnesota	0.5	--
Iowa	0.5	--
Arkansas	1.1	--
Louisiana	1.6	--
Mississippi	0.5	--
<u>Central Flyway</u>		
Montana	1.1	11.1
South Dakota	0.5	--
Wyoming	--	2.8
Nebraska	2.7	--
Colorado	2.2	--
Kansas	3.3	--
New Mexico	1.1	--
Oklahoma	2.7	--
Texas	8.2	8.3
<u>Pacific Flyway</u>		
Washington	3.8	--
Oregon	1.1	--
Idaho	1.1	2.8
California	49.5	58.3
Nevada	2.7	5.6
Utah	10.3	8.3
Arizona	0.5	--
<u>Mexico</u>	<u>2.2</u>	<u>2.8</u>
Total	99.9	100.0
Total recoveries	184	36

Table A-10.--Recovery distribution (percent) of green-winged teal banded during the summer in Alaska, 1948-61

Recovery Location	Adults		Immature and Locals	Total
	Male	Female		
<u>Canada and Alaska</u>				
Alberta	--	--	2.6	1.3
British Columbia	3.4	11.1	7.9	6.6
Alaska	--	11.1	5.3	3.9
<u>Mississippi Flyway</u>				
Illinois	--	11.1	--	1.3
Louisiana	--	--	2.6	1.3
Alabama	--	--	2.6	1.3
<u>Central Flyway</u>				
Montana	--	--	2.6	1.3
Nebraska	--	--	2.6	1.3
Kansas	3.4	--	--	1.3
New Mexico	--	--	2.6	1.3
Oklahoma	--	--	2.6	1.3
Texas	10.3	--	--	3.9
<u>Pacific Flyway</u>				
Washington	17.2	11.1	18.4	17.1
Oregon	10.3	33.3	21.1	18.4
California	51.7	22.2	23.7	34.2
Utah	3.4	--	5.3	3.9
Total	99.7	99.9	99.9	99.7
Total recoveries	29	9	38	76

Table A-11.--Recovery distribution (percent) of green-winged teal banded during the summer in the Rocky Mountains major reference area

Recovery Location	Interior Br. Col. (1947-60)	Eastern Washington (1947-61)	Western Montana (1947-61)
<u>Canada</u>			
Ontario	--	1.1	--
British Columbia	2.0	1.1	--
<u>Mississippi Flyway</u>			
Louisiana	--	1.1	--
<u>Central Flyway</u>			
Montana	--	--	16.6
New Mexico	2.0	--	--
Oklahoma	2.0	--	--
<u>Pacific Flyway</u>			
Washington	12.2	35.6	--
Oregon	6.1	11.4	--
Idaho	--	3.4	8.3
California	61.2	41.3	58.3
Nevada	6.1	1.1	--
Utah	6.1	3.4	8.3
<u>Mexico</u>	<u>2.0</u>	<u>--</u>	<u>8.3</u>
Total	99.9	99.8	99.9
Total recoveries	49	87	12

Table A-12.--Recovery distribution (percent) of green-winged teal banded during the summer in the Puget Sound major reference area, 1946-61

<u>Recovery Location</u>	<u>Coastal Washington</u>	<u>Sauvie Island, Oregon</u>
<u>Canada</u>		
British Columbia	6.4	--
<u>Pacific Flyway</u>		
Washington	65.5	18.8
Oregon	14.5	72.9
Idaho	0.9	--
California	12.7	8.3
Total	100.0	100.0
Total recoveries	110	48

Table A-13.--Recovery distribution (percent) of green-winged teal banded during the summer in the Central Valley major reference area, 1926-61

Recovery Location	Central Valley, California	Interior Oregon
<u>Central Flyway</u>		
Kansas	1.2	--
Texas	1.2	--
<u>Pacific Flyway</u>		
Washington	1.2	--
Oregon	1.2	22.5
California	89.4	67.5
Nevada	3.5	5.0
Utah	--	5.0
Arizona	1.2	--
<u>Mexico</u>	1.2	--
Total	100.1	100.0
Total recoveries	85	40

Table A-14.--Recovery distribution (percent) of green-winged teal banded during the summer in the Salt Lake Valley reference area, 1926-61

<u>Recovery Location</u>	<u>Adults and Unknowns</u>	<u>Immatures</u>	<u>Total</u>
<u>Alaska</u>	1.0	--	0.9
<u>Mississippi Flyway</u>			
Iowa	1.0	--	0.9
Missouri	2.0	--	1.8
Louisiana	1.0	--	0.9
<u>Central Flyway</u>			
Colorado	1.0	--	0.9
Texas	1.0	--	0.9
<u>Pacific Flyway</u>			
California	59.2	35.7	56.3
Nevada	3.1	--	2.7
Utah	22.4	50.0	25.9
Arizona	7.1	7.1	7.1
<u>Mexico</u>	1.0	7.1	1.8
Total	99.8	99.9	100.1
Total recoveries	98	14	112

Table A-15.--Recovery distribution (percent) of green-winged teal banded during the summer in the Colorado - Wyoming major reference area, 1953-61

Recovery
Location

Mississippi Flyway

Iowa	4.8
Louisiana	9.5

Central Flyway

Colorado	23.8
New Mexico	4.8
Texas	33.3

Pacific Flyway

California	14.3
Utah	4.8

Mexico

Total	100.1
Total recoveries	21

Table A-16.--Recovery distribution (percent) of green-winged teal banded during the summer in the Imperial Valley major reference area, 1950-59

Recovery Location	Salton Sea, California	Southern Nevada
<u>Central Flyway</u>		
Texas	0.8	--
<u>Pacific Flyway</u>		
California	96.0	33.3
Nevada	--	46.7
Utah	--	6.7
Arizona	--	13.3
<u>Mexico</u>		
Total	100.0	100.0
Total recoveries	126	15

Table A-17.--Recovery distribution (percent) of green-winged teal banded during September 1947-51, at Tinker Harbour, Labrador, (all immatures)

Recovery Location	Direct	Indirect	Total
<u>Canada</u>			
Ontario	--	20.0	7.1
Labrador	11.1	--	7.1
New Brunswick	11.1	--	7.1
Prince Edward Island	--	40.0	14.3
Nova Scotia	11.1	--	7.1
<u>Atlantic Flyway</u>			
Vermont	22.2	--	14.3
New Jersey	11.1	--	7.1
Delaware	--	20.0	7.1
South Carolina	11.1	--	7.1
<u>Mississippi Flyway</u>			
Ohio	11.1	--	7.1
Mississippi	--	20.0	7.1
Alabama	11.1	--	7.1
Total	99.9	100.0	99.6
Total recoveries	9	5	14

Table A-18.--Recovery distribution (percent) of green-winged teal banded during September and October 1947-51, in Newfoundland

Recovery Location	September			October		
	Adult	Imm.	Total	Adult	Imm.	Total
<u>Canada</u>						
Ontario	--	3.0	1.9	--	--	--
Newfoundland	10.5	6.1	7.7	5.9	6.7	6.2
New Brunswick	--	12.1	7.7	5.9	--	3.1
Prince Edward Is.	10.5	9.1	9.6	5.9	--	3.1
Nova Scotia	5.3	18.2	13.5	17.6	33.3	25.0
<u>Atlantic Flyway</u>						
Maine	15.8	6.1	9.6	--	--	--
Massachusetts	5.3	6.1	5.8	--	--	--
Connecticut	10.5	3.0	5.8	--	--	--
Rhode Island	5.3	--	1.9	--	--	--
New York	--	3.0	1.9	11.8	13.3	12.5
New Jersey	--	12.1	7.7	29.4	20.0	25.0
Delaware	10.5	--	3.8	11.8	6.7	9.4
Maryland	5.3	3.0	3.8	--	--	--
Virginia	5.3	9.1	7.7	11.8	6.7	9.4
North Carolina	10.5	--	3.8	--	6.7	3.1
South Carolina	--	--	--	--	6.7	3.1
Florida	5.3	3.0	3.8	--	--	--
<u>Mississippi Flyway</u>						
Louisiana	--	3.0	1.9	--	--	--
Alabama	--	3.0	1.9	--	--	--
Total	100.1	99.9	99.9	100.1	100.1	99.9
Total recoveries	19	33	52	17	15	32

Table A-19.--Recovery distribution (percent) of green-winged teal banded during September 1947-61, at Baie Johan Beetz, Quebec

Recovery Location	Adults		Immature	Total
	Male	Female		
<u>Canada</u>				
Ontario	--	--	0.8	0.6
Quebec	12.0	7.4	13.2	12.2
Newfoundland	--	--	0.8	0.6
New Brunswick	8.0	18.5	14.7	14.4
Prince Edward Is.	8.0	22.2	7.7	9.9
Nova Scotia	4.0	7.4	11.6	9.9
<u>Atlantic Flyway</u>				
Maine	8.0	7.4	7.0	7.2
Vermont	4.0	--	0.8	1.1
Massachusetts	--	--	3.1	2.2
Connecticut	--	--	1.5	1.1
New York	4.0	--	3.1	2.8
Pennsylvania	--	--	0.8	0.6
New Jersey	--	3.7	7.0	5.5
Delaware	4.0	7.4	2.3	3.3
Maryland	--	7.4	1.5	2.2
Virginia	8.0	--	2.3	2.8
North Carolina	12.0	7.4	3.9	5.5
South Carolina	12.0	--	1.5	2.8
Florida	4.0	7.4	11.6	9.9
<u>Mississippi Flyway</u>				
Michigan	--	--	0.8	0.6
Minnesota	--	3.7	--	0.6
Ohio	--	--	0.8	0.6
Mississippi	--	--	0.8	0.6
Alabama	4.0	--	2.3	2.2
<u>Central Flyway</u>				
Nebraska	8.0	--	--	1.1
Total	100.0	99.9	99.9	100.3
Total recoveries	25	27	129	181

Table A-20.--Recovery distribution (percent) of green-winged teal banded during October 1947-61, at Baie Johan Beetz, Quebec

Recovery Location	Adults		Immature	Total
	Male	Female		
<u>Canada</u>				
Ontario	25.0	--	--	2.6
Quebec	--	--	3.9	2.6
New Brunswick	25.0	22.2	19.2	20.5
Nova Scotia	--	11.1	7.7	7.7
<u>Atlantic Flyway</u>				
Maine	--	--	7.7	5.1
Vermont	--	11.1	--	2.6
Massachusetts	--	--	11.5	7.7
New York	--	11.1	--	2.6
New Jersey	--	--	11.5	7.7
Delaware	25.0	11.1	--	5.1
Maryland	--	11.1	--	2.6
Virginia	--	--	7.7	5.1
North Carolina	--	--	15.4	10.3
South Carolina	--	--	7.7	5.1
Florida	--	22.2	7.7	10.3
<u>Mississippi Flyway</u>				
Illinois	25.0	--	--	2.6
Total	100.0	99.9	100.0	100.2
Total recoveries	4	9	26	39

Table A-21.--Recovery distribution (percent) of all green-winged teal banded during October, November and December 1930-61, in Ohio and West Virginia

Recovery Location	Direct	Indirect	Total
<u>Atlantic Flyway</u>			
West Virginia	11.1	--	7.1
Georgia	--	20.0	7.1
<u>Mississippi Flyway</u>			
Illinois	11.1	--	7.1
Ohio	33.3	40.0	35.7
Tennessee	22.2	20.0	21.4
Louisiana	11.1	--	7.1
<u>Central Flyway</u>			
Oklahoma	11.1	--	7.1
Texas	--	20.0	7.1
Total	99.9	100.0	99.7
Total recoveries	9	5	14

Table A-22.--Recovery distribution (percent) of green-winged teal banded during October and November 1933-46, in the Lake Michigan area

Recovery Location	Direct	Indirect	Total
<u>Canada</u>			
Ontario	2.9	4.2	3.4
<u>Atlantic Flyway</u>			
South Carolina	--	4.2	1.7
Florida	5.8	--	3.4
<u>Mississippi Flyway</u>			
Wisconsin	35.3	20.8	29.3
Michigan	--	8.3	3.4
Iowa	--	8.3	3.4
Illinois	11.8	16.7	13.8
Indiana	8.8	--	5.2
Ohio	--	4.2	1.7
Missouri	5.9	4.2	5.2
Kentucky	5.9	--	3.4
Tennessee	8.8	8.3	8.6
Louisiana	2.9	4.2	3.4
Mississippi	2.9	--	1.7
Alabama	2.9	--	1.7
<u>Central Flyway</u>			
South Dakota	--	4.2	1.7
Nebraska	2.9	--	1.7
Kansas	--	8.3	3.4
Texas	2.9	--	1.7
<u>Mexico</u>			
Total	99.7	100.1	99.5
Total recoveries	34	24	58

Table A-23.--Recovery distribution (percent) of green-winged teal banded during the fall 1946-61, in Manitoba

Recovery Location	September	October
<u>Canada</u>		
Ontario	--	1.9
Manitoba	27.0	7.7
<u>Atlantic Flyway</u>		
Florida	5.4	--
<u>Mississippi Flyway</u>		
Minnesota	8.1	9.6
Wisconsin	--	3.8
Iowa	5.4	13.5
Illinois	--	9.6
Ohio	--	1.9
Missouri	10.8	3.8
Louisiana	10.8	19.2
<u>Central Flyway</u>		
North Dakota	2.7	1.9
South Dakota	5.4	3.8
Nebraska	5.4	1.9
Kansas	--	7.7
Oklahoma	5.4	3.8
Texas	8.1	9.6
<u>Pacific Flyway</u>		
Oregon	2.7	--
California	2.7	--
Total	99.9	99.7
Total recoveries	37	52

Table A-24.--Recovery distribution (percent) of green-winged teal banded during October 1935-61, in Minnesota

Recovery Location	Adults	Immatures	Total
<u>Mississippi Flyway</u>			
Minnesota	40.9	50.0	46.0
Wisconsin	--	3.6	2.0
Iowa	13.6	14.3	14.0
Missouri	4.5	3.6	4.0
Arkansas	--	7.1	4.0
Louisiana	9.1	7.1	8.0
Mississippi	--	3.6	2.0
<u>Central Flyway</u>			
South Dakota	4.5	--	2.0
Kansas	18.2	3.6	10.0
Texas	4.5	7.1	6.0
<u>Pacific Flyway</u>			
California	4.5	--	2.0
Total	99.8	100.0	100.0
Total recoveries	22	28	50

Table A-25.--Recovery distribution (percent) of green-winged teal banded during September and October 1944-50, in southern Saskatchewan

Recovery Location	Adults	Immatures	Total
<u>Canada</u>			
Saskatchewan	--	9.1	3.4
<u>Mississippi Flyway</u>			
Minnesota	5.6	--	3.4
Missouri	--	9.1	3.4
Tennessee	--	9.1	3.4
Louisiana	5.6	18.2	10.3
<u>Central Flyway</u>			
South Dakota	5.6	--	3.4
Nebraska	11.1	9.1	10.3
Kansas	16.7	18.2	17.2
Oklahoma	16.7	18.2	17.2
Texas	33.3	9.1	24.1
<u>Pacific Flyway</u>			
California	5.6	--	3.4
Total	100.2	100.1	99.5
Total recoveries	18	11	29

Table A-26.--Recovery distribution (percent) of green-winged teal banded during September 1946-58, in northern Alberta and Mackenzie District

Recovery Location	Northern Alberta	Mackenzie District
<u>Canada</u>		
Saskatchewan	--	6.3
Alberta	--	12.5
<u>Mississippi Flyway</u>		
Minnesota	15.4	--
Wisconsin	7.7	--
Louisiana	15.4	6.3
<u>Central Flyway</u>		
Montana	--	6.3
Wyoming	--	6.3
Nebraska	15.4	6.3
Kansas	7.7	--
Oklahoma	--	6.3
Texas	7.7	12.5
<u>Pacific Flyway</u>		
Washington	--	6.3
Idaho	--	6.3
California	23.1	12.5
Nevada	--	12.5
<u>Mexico</u>	7.7	--
Total	100.1	100.4
Total recoveries	13	16

Table A-27.--Recovery distribution (percent) of green-winged teal banded during the fall 1936-60, in Missouri

Recovery Location	Direct	Indirect
<u>Canada</u>		
Manitoba	--	10.0
Saskatchewan	--	5.0
<u>Mississippi Flyway</u>		
Minnesota	--	20.0
Iowa	2.9	10.0
Missouri	37.1	--
Arkansas	5.7	--
Tennessee	2.9	--
Louisiana	11.4	25.0
Mississippi	2.9	5.0
Alabama	2.9	--
<u>Central Flyway</u>		
Nebraska	14.3	5.0
Kansas	8.6	5.0
New Mexico	--	5.0
Oklahoma	2.9	--
Texas	8.6	5.0
<u>Pacific Flyway</u>		
Utah	--	5.0
Total	100.2	100.0
Total recoveries	35	20

Table A-28.--Recovery distribution (percent) of green-winged teal banded during the fall 1935-61, in Kansas, Oklahoma and northern Texas

Recovery Location	Direct	Indirect
<u>Canada</u>		
Saskatchewan	--	5.3
<u>Mississippi Flyway</u>		
Illinois	3.1	--
Missouri	3.1	--
Louisiana	3.1	5.3
Mississippi	--	5.3
<u>Central Flyway</u>		
North Dakota	--	10.5
South Dakota	--	5.3
Nebraska	3.1	10.5
Kansas	21.9	15.8
New Mexico	3.1	--
Oklahoma	46.9	15.8
Texas	15.6	26.3
Total	99.9	100.1
Total recoveries	32	19

Table A-29.--Recovery distribution (percent) of green-winged teal banded during the fall 1922-41, in Louisiana

Recovery Location	Direct	Indirect
<u>Canada</u>		
Alberta	--	2.8
<u>Mississippi Flyway</u>		
Minnesota	--	11.1
Michigan	--	2.8
Iowa	--	2.8
Illinois	--	5.6
Missouri	--	2.8
Louisiana	100.0	22.2
<u>Central Flyway</u>		
North Dakota	--	5.6
South Dakota	--	2.8
Nebraska	--	5.6
Kansas	--	8.3
Oklahoma	--	11.1
Texas	--	11.1
<u>Pacific Flyway</u>		
California	--	5.6
Total	100.0	100.2
Total recoveries	26	36

Table A-30.--Recovery distribution (percent) of green-winged teal banded during the fall 1926-61, in the Puget Sound area

Recovery Location	October		November		December-January		Total	
	Direct	Indirect	Direct	Indirect	Direct	Indirect	Direct	Indirect
<u>Canada and Alaska</u>								
Alberta	--	--	--	--	0.8	--	0.7	--
British Columbia	21.0	24.1	42.9	21.7	25.8	31.3	29.7	26.5
Alaska	--	--	--	1.7	--	3.0	--	2.1
<u>Central Flyway</u>								
Montana	--	--	--	--	0.8	--	--	--
<u>Pacific Flyway</u>								
Washington	69.2	37.9	46.7	54.1	58.1	52.2	59.5	51.6
Oregon	5.6	20.7	4.8	10.0	16.1	7.5	6.5	9.9
California	3.5	3.4	5.7	10.0	--	3.7	3.9	6.4
Nevada	0.7	13.8	--	0.7	--	0.7	0.4	2.1
Utah	--	--	--	--	--	0.7	--	0.4
Total	100.0	99.9	100.1	99.8	100.0	99.8	100.0	100.1
Total recoveries	143	29	105	120	31	134	279	283

Table A-31.--Recovery distribution (percent) of green-winged teal banded during the fall 1947-61, in Idaho and eastern Washington

Recovery Location	October		November		December		Total	
	Direct	Indirect	Direct	Indirect	Direct	Indirect	Direct	Indirect
<u>Canada</u>								
Alberta	--	--	--	--	--	--	--	2.9
British Columbia	--	5.6	--	--	--	--	--	2.9
<u>Mississippi Flyway</u>								
Minnesota	--	--	--	10.0	--	--	--	2.9
<u>Pacific Flyway</u>								
Washington	49.2	50.0	64.3	60.0	75.0	71.4	55.9	57.1
Oregon	9.5	5.6	14.3	20.0	18.7	--	11.8	8.6
Idaho	1.6	5.6	7.1	--	--	--	2.2	2.9
California	34.9	33.3	14.3	--	6.3	28.6	26.9	22.9
Nevada	1.6	--	--	--	--	--	1.1	--
Utah	3.2	--	--	--	--	--	2.2	--
Total	100.0	100.1	100.0	100.0	100.0	100.0	100.1	100.2
Total recoveries	63	18	14	10	16	7	93	35

Table A-32.--Recovery distribution (percent) of green-winged teal banded during the fall 1937-40, in
Interior Oregon

Recovery Location	October		November		December-January		Total	
	Direct	Indirect	Direct	Indirect	Direct	Indirect	Direct	Indirect
<u>Canada and Alaska</u>								
British Columbia	0.7	--	3.2	--	--	--	1.3	
Yukon	0.7	--	--	--	--	--	0.4	
Alaska	1.5	--	1.6	--	2.5	--	1.7	
<u>Mississippi Flyway</u>								
Missouri	0.7	--	--	--	--	--	0.4	--
<u>Central Flyway</u>								
Montana	--	0.7	--	--	--	--	0.8	
Texas	--	--	--	--	--	--	0.4	
<u>Pacific Flyway</u>								
Washington	2.9	7.3	--	12.6	--	2.5	1.6	7.9
Oregon	10.7	3.6	10.8	4.8	--	30.0	10.3	8.3
Idaho	2.1	1.5	1.1	3.2	--	5.0	1.6	2.5
California	78.6	79.6	83.8	68.2	100.0	55.0	81.5	72.5
Nevada	2.9	1.5	3.2	4.8	--	--	2.9	2.1
Utah	1.4	2.2	--	--	--	--	0.8	1.3
Arizona	0.7	--	1.1	1.6	--	--	0.8	0.4
Mexico	--	0.7	--	--	--	--	--	0.4
Total	100.0	100.0	100.1	100.0	100.0	100.0	99.9	100.0
Total recoveries	140	137	93	63	10	40	243	240

Table A-33.--Recovery distribution (percent) of green-winged teal banded during October - January 1924-54, in coastal Oregon and northern California

Recovery Location	Direct	Indirect
<u>Canada</u>		
Alberta	--	2.8
British Columbia	--	11.1
<u>Pacific Flyway</u>		
Washington	25.0	27.8
Oregon	50.0	36.1
California	25.0	22.2
Total	100.0	100.0
Total recoveries	24	36

Table A-34.--Recovery distribution (percent) of green-winged teal banded during October - January 1929-60, in central California

Recovery Location	Direct	Indirect
<u>Canada and Alaska</u>		
Alberta	--	1.0
British Columbia	--	1.0
Alaska	--	1.0
<u>Pacific Flyway</u>		
Western Montana	--	1.0
Washington	--	2.0
Oregon	--	5.0
Idaho	--	1.0
California	100.0	82.0
Nevada	--	4.0
Utah	--	2.0
Total	100.0	100.0
Total recoveries	64	99

Table A-35.--Recovery distribution (percent) of green-winged teal banded during October - January 1948-61, at Salton Sea, California

Recovery Location	Direct	Indirect
<u>Mississippi Flyway</u>		
Minnesota	--	1.9
<u>Pacific Flyway</u>		
Washington	--	1.9
Idaho	--	1.9
California	92.6	83.3
Utah	--	7.4
Arizona	3.7	--
<u>Guiana</u>		
	3.7	--
<u>Mexico</u>		
Total	--	3.7
Total recoveries	100.0	100.1
	27	54

Table A-36.--Recovery distribution (percent) of green-winged teal banded during the fall 1945-53, in Arizona

Recovery Location	Direct	Indirect
<u>Pacific Flyway</u>		
California	--	20.0
Utah	--	20.0
Arizona	100.0	40.0
<u>Mexico</u>	--	20.0
Total	100.0	100.0
Total recoveries	5	5

Table A-37.--Recovery distribution (percent) of green-winged teal banded during the fall 1937-60, in New Mexico and Colorado

Recovery Location	Direct	Indirect
<u>Canada</u>		
Alberta	--	9.1
<u>Mississippi Flyway</u>		
Louisiana	--	9.1
<u>Central Flyway</u>		
Colorado	21.4	--
New Mexico	57.1	18.2
<u>Pacific Flyway</u>		
California	7.1	36.4
Nevada	--	9.1
Utah	--	9.1
<u>Mexico</u>	14.3	9.1
Total	99.9	100.1
Total recoveries	14	11

Table A-38.--Recovery distribution (percent) of green-winged teal banded during the winter 1939-61, in the two reference areas of the Atlantic Flyway

Recovery Location	Mid-Atlantic Coastal	Chesapeake and Delaware Bays
<u>Canada</u>		
Ontario	3.8	11.1
Quebec	--	11.1
New Brunswick	11.5	--
Nova Scotia	3.8	--
<u>Atlantic Flyway</u>		
Maine	3.8	--
New York	7.7	--
Pennsylvania	--	11.1
New Jersey	15.4	22.2
Delaware	7.7	11.1
Virginia	23.1	--
North Carolina	23.1	22.2
<u>Central Flyway</u>		
North Dakota	--	11.1
Total	99.9	99.9
Total recoveries	26	9

Table A-39.--Recovery distribution (percent) of green-winged teal banded during the winter 1916-58, in the South Central reference area

Recovery Location	Texas	Kansas-Oklahoma	Louisiana	Total
<u>Canada</u>				
Saskatchewan	5.0	--	--	1.9
Yukon	--	7.7	--	1.9
<u>Mississippi Flyway</u>				
Minnesota	--	7.7	--	1.9
Iowa	--	7.7	--	1.9
Louisiana	--	--	73.6	26.9
<u>Central Flyway</u>				
North Dakota	5.0	--	--	1.9
South Dakota	--	7.7	5.3	3.8
Nebraska	--	23.1	5.3	7.7
Colorado	5.0	--	5.3	3.8
Kansas	--	7.7	--	1.9
Oklahoma	5.0	7.7	--	3.8
Texas	80.0	7.7	10.5	36.5
<u>Pacific Flyway</u>				
California	--	7.7	--	1.9
Nevada	--	7.7	--	1.9
Utah	--	7.7	--	1.9
Total	100.0	100.1	100.0	99.6
Total recoveries	20	13	19	52

Table A-40.--Recovery distribution (percent) of green-winged teal banded during the winter 1949-51, in Colorado

Recovery
Location

Mississippi Flyway

Illinois 9.1

Central Flyway

Nebraska 9.1
Colorado 45.5
Oklahoma 9.1
Texas 9.1

Pacific Flyway

Idaho 9.1

Utah 9.1

Total 100.1

Total recoveries 11

Table A-41.--Recovery distribution (percent) of green-winged teal banded during the winter 1932-61, in the Puget Sound reference area

Recovery Location	British Columbia	Washington	Oregon	Total
<u>Canada and Alaska</u>				
Alberta	1.2	--	--	0.6
British Columbia	45.1	--	7.1	26.9
Alaska	7.3	--	1.8	4.5
<u>Central Flyway</u>				
Montana	--	--	1.8	0.6
Nebraska	--	5.3	--	0.6
<u>Pacific Flyway</u>				
Washington	39.0	84.2	21.4	37.2
Oregon	6.1	5.3	64.3	26.9
California	1.2	5.3	3.6	2.6
Total	99.9	100.1	100.0	99.9
Total recoveries	82	19	56	157

Table A-42.--Recovery distribution (percent) of green-winged teal banded during the winter 1948-61, in the Central Valley reference area

Recovery Location	California	Oregon	Total
<u>Canada and Alaska</u>			
British Columbia	--	5.3	2.1
Alaska	--	2.6	1.0
<u>Central Flyway</u>			
Wyoming	1.7	--	1.0
<u>Pacific Flyway</u>			
Washington	5.1	--	3.1
Oregon	6.8	52.6	24.7
Idaho	--	5.3	2.1
California	79.7	28.9	59.8
Nevada	1.7	--	1.0
Utah	5.1	2.6	4.1
<u>Mexico</u>	--	2.6	1.0
Total	100.1	99.9	99.9
Total recoveries	59	38	97

Table A-43.--Recovery distribution (percent) of green-winged teal banded during the winter 1950-58, in the Imperial Valley reference area

Recovery Location	Salton Sea	Nevada	Total
<u>Canada</u>			
Saskatchewan	0.1	--	0.1
Alberta	0.8	--	0.8
British Columbia	0.1	--	0.1
<u>Mississippi Flyway</u>			
Iowa	0.1	--	0.1
Ohio	0.1	--	0.1
Missouri	0.1	--	0.1
<u>Central Flyway</u>			
Montana	0.1	--	0.1
Nebraska	0.1	--	0.1
Kansas	0.4	--	0.3
Texas	0.2	4.0	0.3
<u>Pacific Flyway</u>			
Washington	0.2	--	0.2
Oregon	0.6	--	0.6
Idaho	0.6	8.0	0.8
California	83.6	36.0	82.0
Nevada	2.5	24.0	3.1
Utah	7.8	20.0	8.4
Arizona	0.8	4.0	0.9
Mexico	1.5	4.0	1.7
Total	99.7	100.0	99.8
Total recoveries	844	25	872 *

*Includes 3 recoveries in Arizona.

Table A-44.--Recovery distribution (percent) of green-winged teal banded during the spring 1921-52, in Louisiana and southern Texas

Recovery Location	Louisiana	Texas	Total
<u>Canada</u>			
Saskatchewan	8.3	--	4.3
Alberta	--	9.1	4.3
<u>Atlantic Flyway</u>			
Alabama	--	9.1	4.3
<u>Mississippi Flyway</u>			
Minnesota	8.3	--	4.3
Iowa	8.3	--	4.3
Illinois	8.3	--	4.3
<u>Central Flyway</u>			
South Dakota	16.7	--	8.7
Wyoming	--	9.1	4.3
Nebraska	8.3	9.1	8.7
Colorado	8.3	--	4.3
Kansas	8.3	9.1	8.7
Texas	8.3	54.5	30.4
<u>Pacific Flyway</u>			
California	16.7	--	8.7
Total	99.8	100.0	99.6
Total recoveries	12	11	23

Table A-45.--Recovery distribution (percent) of green-winged teal banded during the spring 1936-58, in Oklahoma and northern Texas

Recovery Location	Male	Female	Total
<u>Mississippi Flyway</u>			
Wisconsin	1.3	--	1.2
Iowa	1.3	--	1.2
Ohio	1.3	--	1.2
Missouri	1.3	11.1	2.4
Arkansas	4.0	22.2	6.0
Louisiana	6.7	--	6.0
<u>Central Flyway</u>			
Montana	1.3	--	1.2
South Dakota	5.3	22.2	7.1
Nebraska	9.3	--	8.3
Kansas	12.0	--	10.7
Oklahoma	--	11.1	1.2
Texas	28.0	22.2	27.4
<u>Pacific Flyway</u>			
Idaho	1.3	--	1.2
California	18.7	--	16.7
Utah	6.7	--	6.0
<u>Mexico</u>	1.3	11.1	2.4
Total	99.8	99.9	100.2
Total recoveries	75	9	84

Table A-46.--Recovery distribution (percent) of green-winged teal banded during the spring 1926-61, in Kansas

Recovery Location	Male	Female	Total
<u>Canada</u>			
Ontario	--	4.5	0.9
Manitoba	2.2	--	1.8
Saskatchewan	1.1	--	0.9
Alberta	1.1	--	0.9
Mackenzie	1.1	--	0.9
<u>Mississippi Flyway</u>			
Minnesota	6.7	--	5.4
Wisconsin	1.1	--	0.9
Iowa	1.1	9.1	2.7
Missouri	1.1	--	0.9
Tennessee	1.1	--	0.9
Louisiana	2.2	4.5	2.7
Mississippi	1.1	--	0.9
<u>Central Flyway</u>			
Montana	--	4.5	0.9
North Dakota	1.1	--	0.9
South Dakota	2.2	--	1.8
Nebraska	7.8	13.6	8.9
Colorado	2.2	4.5	2.7
Kansas	13.3	18.2	14.3
Oklahoma	4.4	9.1	5.4
Texas	34.4	27.3	33.0
<u>Pacific Flyway</u>			
California	11.1	4.5	9.8
Nevada	1.1	--	0.9
Utah	2.2	--	1.8
Total	99.7	99.8	100.2
Total recoveries	90	22	112

Table A-47.--Recovery distribution (percent) of green-winged teal banded during the spring 1950-56, in Missouri

Recovery Location	Male	Female	Total
<u>Canada</u>			
Saskatchewan	3.4	--	2.9
<u>Mississippi Flyway</u>			
Minnesota	--	20.0	2.9
Wisconsin	3.4	--	2.9
Missouri	3.4	--	2.9
Arkansas	3.4	--	2.9
Louisiana	31.0	20.0	29.4
Mississippi	3.4	--	2.9
<u>Central Flyway</u>			
South Dakota	3.4	--	2.9
Nebraska	3.4	--	2.9
Colorado	3.4	--	2.9
Kansas	3.4	--	2.9
Oklahoma	3.4	--	2.9
Texas	20.7	40.0	23.5
<u>Pacific Flyway</u>			
Oregon	3.4	--	2.9
California	6.9	--	5.9
Nevada	3.4	--	2.9
<u>Mexico</u>	--	20.0	2.9
Total	99.4	100.0	99.4
Total recoveries	29	5	34

Table A-48.--Recovery distribution (percent) of green-winged teal banded during the spring 1951-61, in Nebraska and South Dakota

Recovery Location	Male	Female	Total
<u>Mississippi Flyway</u>			
Missouri	5.6	--	4.7
Louisiana	5.6	33.3	9.5
<u>Central Flyway</u>			
Nebraska	11.1	--	9.5
Kansas	11.1	33.3	14.3
Oklahoma	5.6	--	4.7
Texas	27.8	--	23.8
<u>Pacific Flyway</u>			
California	27.8	33.3	28.6
Utah	5.6	--	4.7
Total	100.2	99.9	99.9
Total recoveries	18	3	21

Table A-49.--Recovery distribution (percent) of green-winged teal banded during the spring 1933-36, in the Puget Sound area

Recovery Location	Male	Female	Total
<u>Canada and Alaska</u>			
Alberta	1.8	--	0.9
British Columbia	21.4	28.8	25.0
Alaska	1.8	5.8	3.7
<u>Pacific Flyway</u>			
Washington	55.4	53.8	54.6
Oregon	7.1	7.7	7.4
California	8.9	3.8	6.5
Utah	3.6	--	1.9
Total	100.0	99.9	100.0
Total recoveries	56	52	108

Table A-50.--Recovery distribution (percent) of green-winged teal banded during the spring 1930-51, in Oregon

Recovery Location	Interior	Coastal	Total
<u>Canada</u>			
British Columbia	8.7	--	7.7
<u>Pacific Flyway</u>			
Washington	8.7	33.3	11.5
Oregon	2.2	16.7	3.8
California	78.3	50.0	75.0
Nevada	2.2	--	1.9
Total	100.1	100.0	99.9
Total recoveries	46	6	52

Table A-51.--Recovery distribution (percent) of green-winged teal banded during the spring 1955-61, in Idaho

Recovery Location	Male	Female	Total
<u>Canada</u>			
Alberta	--	33.3	7.7
British Columbia	--	33.3	7.7
<u>Pacific Flyway</u>			
Idaho	--	33.3	7.7
California	90.0	--	69.2
Utah	10.0	--	7.7
Total	100.0	99.9	100.0
Total recoveries	10	3	13

Table A-52.--Recovery distribution (percent) of green-winged teal banded during the spring 1940-57, in the Central Valley of California

Recovery Location	Male	Female	Total
<u>Canada</u>			
Alberta	--	6.7	1.6
British Columbia	2.1	--	1.6
<u>Pacific Flyway</u>			
Washington	2.1	--	1.6
Oregon	2.1	6.7	3.2
California	83.0	86.7	83.9
Nevada	4.3	--	3.2
Utah	6.4	--	4.8
Total	100.0	100.1	99.9
Total recoveries	47	15	62

Table A-53.--Recovery distribution (percent) of green-winged teal banded during the spring 1959-61, in the Imperial Valley

Recovery Location	Male	Female	Total
<u>Canada</u>			
Saskatchewan	0.7	--	0.5
Alberta	0.7	2.4	1.0
<u>Mississippi Flyway</u>			
Wisconsin	0.6	--	0.5
<u>Pacific Flyway</u>			
Oregon	--	4.8	1.0
California	84.3	81.0	83.6
Nevada	1.3	--	1.0
Utah	9.1	9.5	9.2
<u>Mexico</u>	2.6	2.4	2.6
Total	99.9	100.1	99.9
Total recoveries	153	42	195

Table A-54.--Recovery distribution (percent) of green-winged teal banded during the spring 1948-61, in Nevada

Recovery Location	Male	Female	Total
<u>Central Flyway</u>			
Montana	--	25.0	3.6
<u>Pacific Flyway</u>			
Washington	--	25.0	3.6
California	75.0	25.0	67.9
Nevada	4.2	--	3.6
Utah	4.2	25.0	7.1
<u>Mexico</u>	<u>16.7</u>	--	<u>14.2</u>
Total	100.1	100.0	100.0
Total recoveries	24	4	28

RECOVERY DISTRIBUTION FIGURES

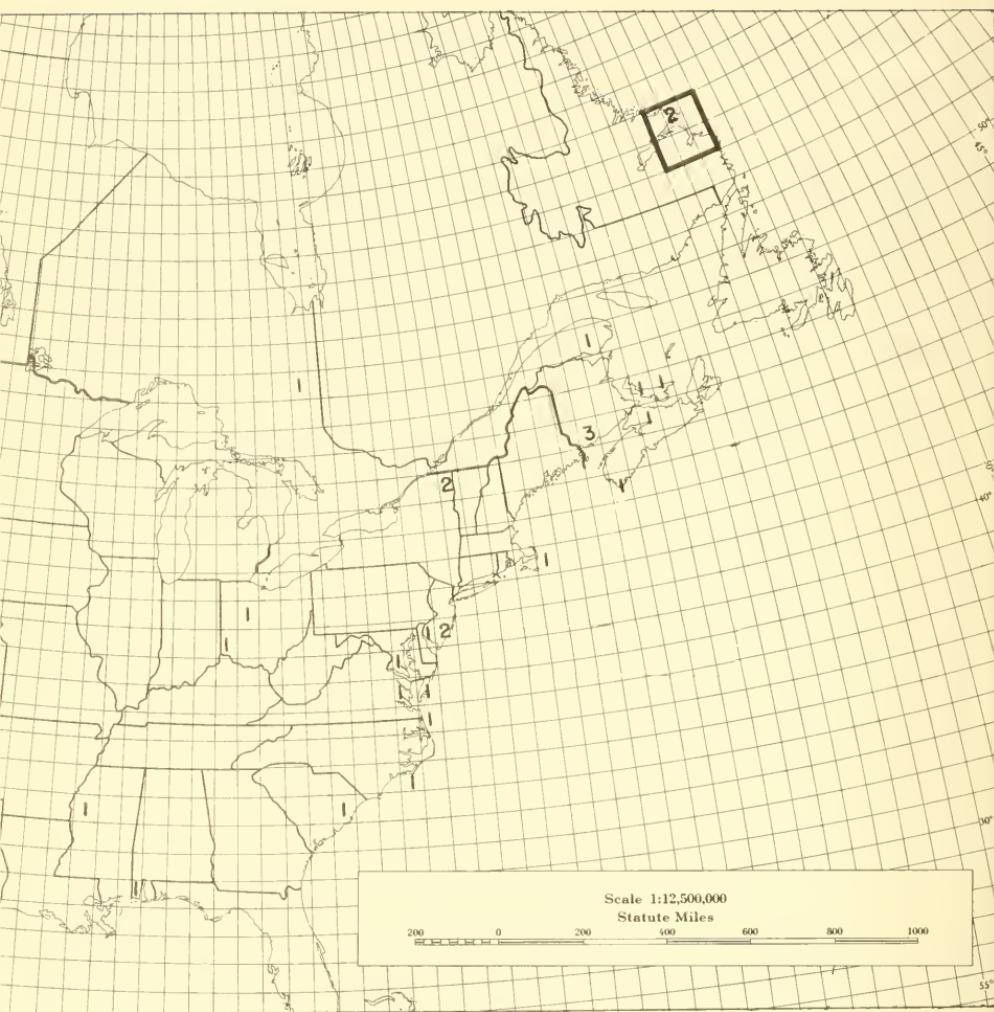


Figure A-1.--Recovery distribution of green-winged teal banded during the summer and fall in Labrador.

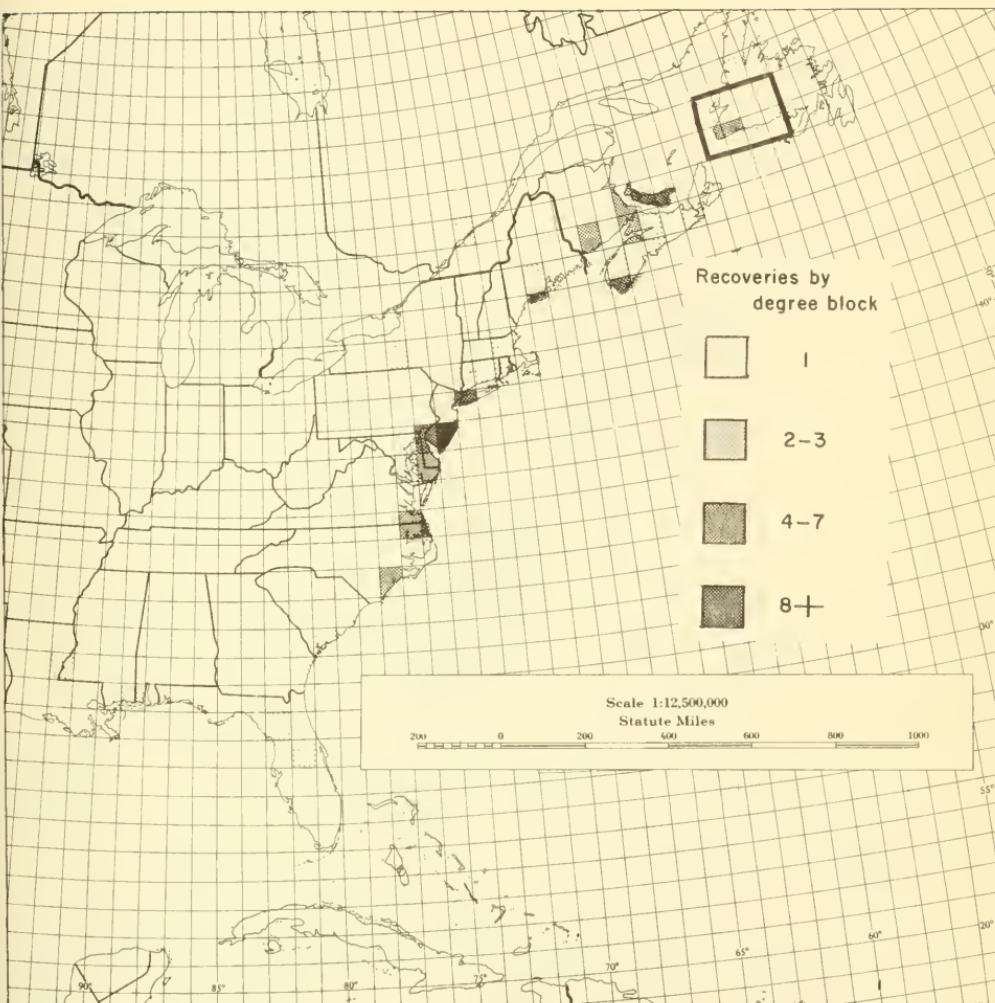


Figure A-2---Recovery distribution of green-winged teal banded during the summer and fall in Newfoundland.

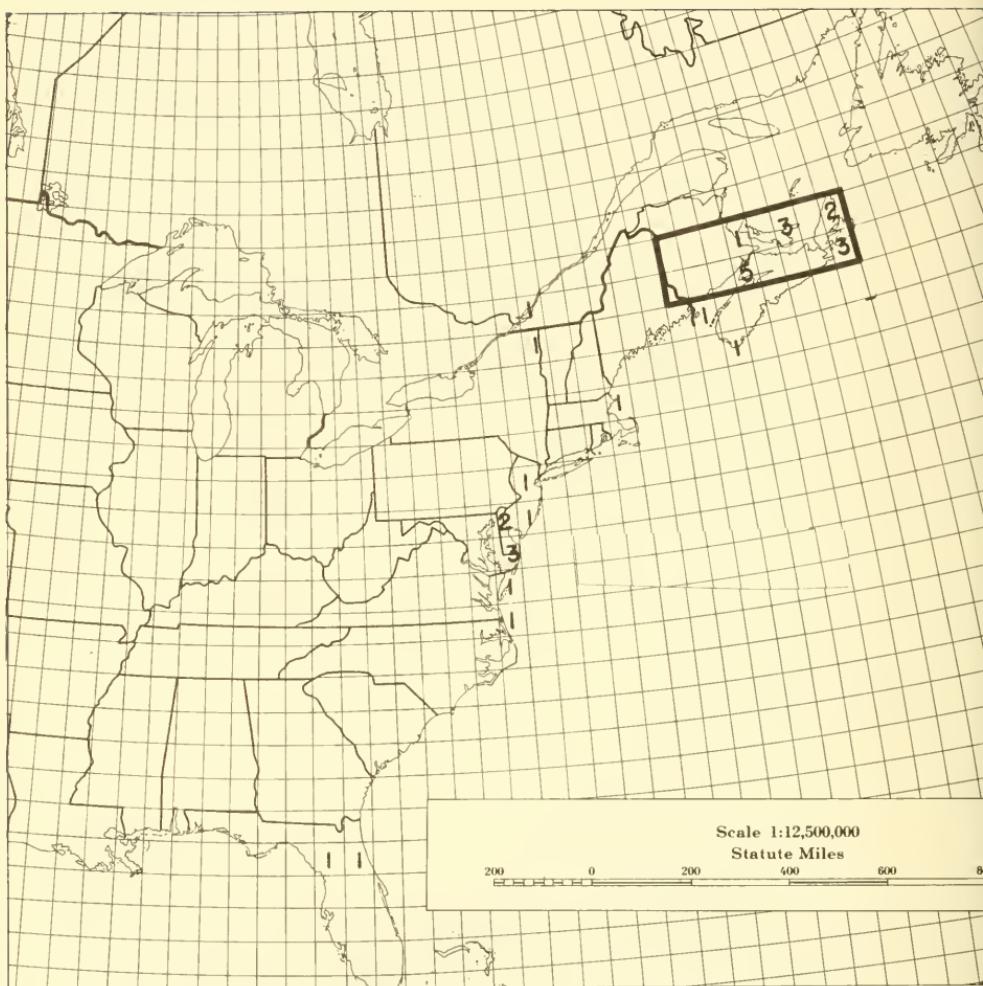


Figure A-3.--Recovery distribution of green-winged teal banded during the summer in New Brunswick, Nova Scotia, and Prince Edward Island.

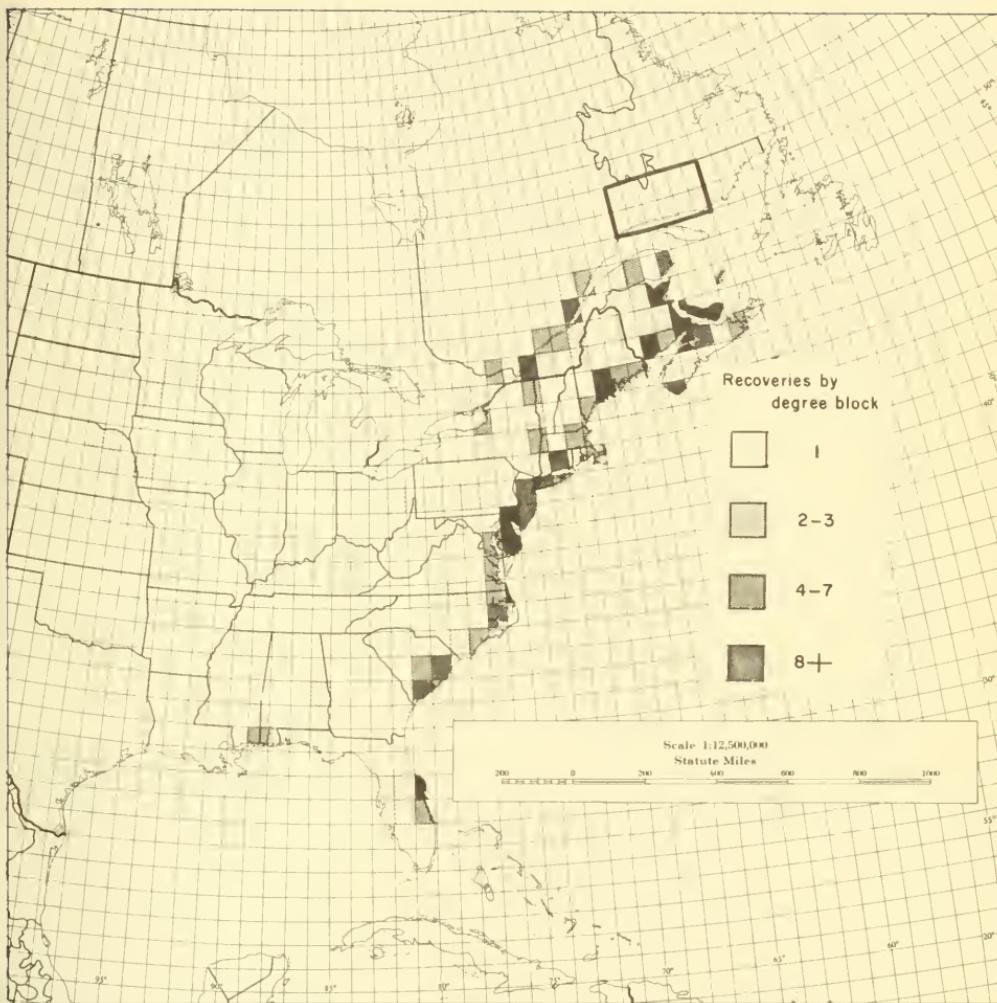


Figure A-4.--Recovery distribution of green-winged teal banded during the summer and September at Baie Johan Beetz, Quebec.

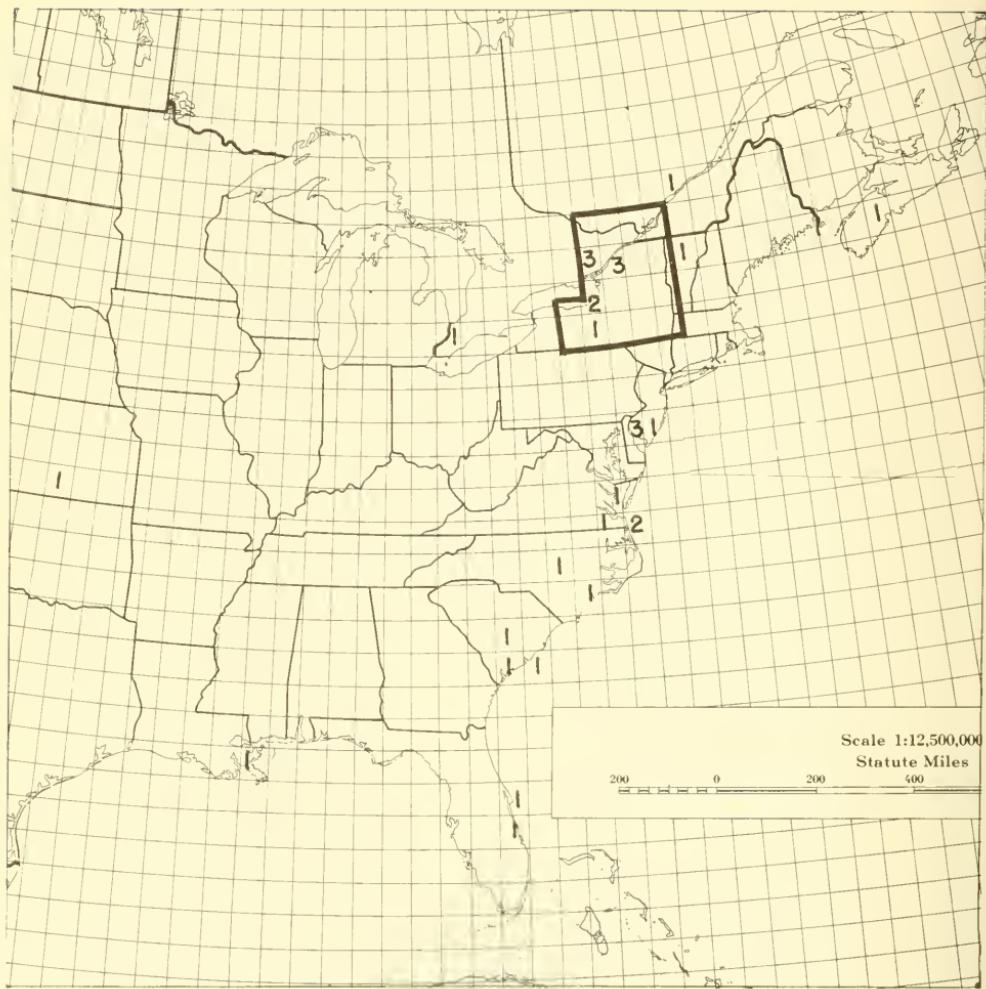


Figure A-5.--Recovery distribution of green-winged teal banded during the summer and fall in the eastern Lake Ontario reference area.

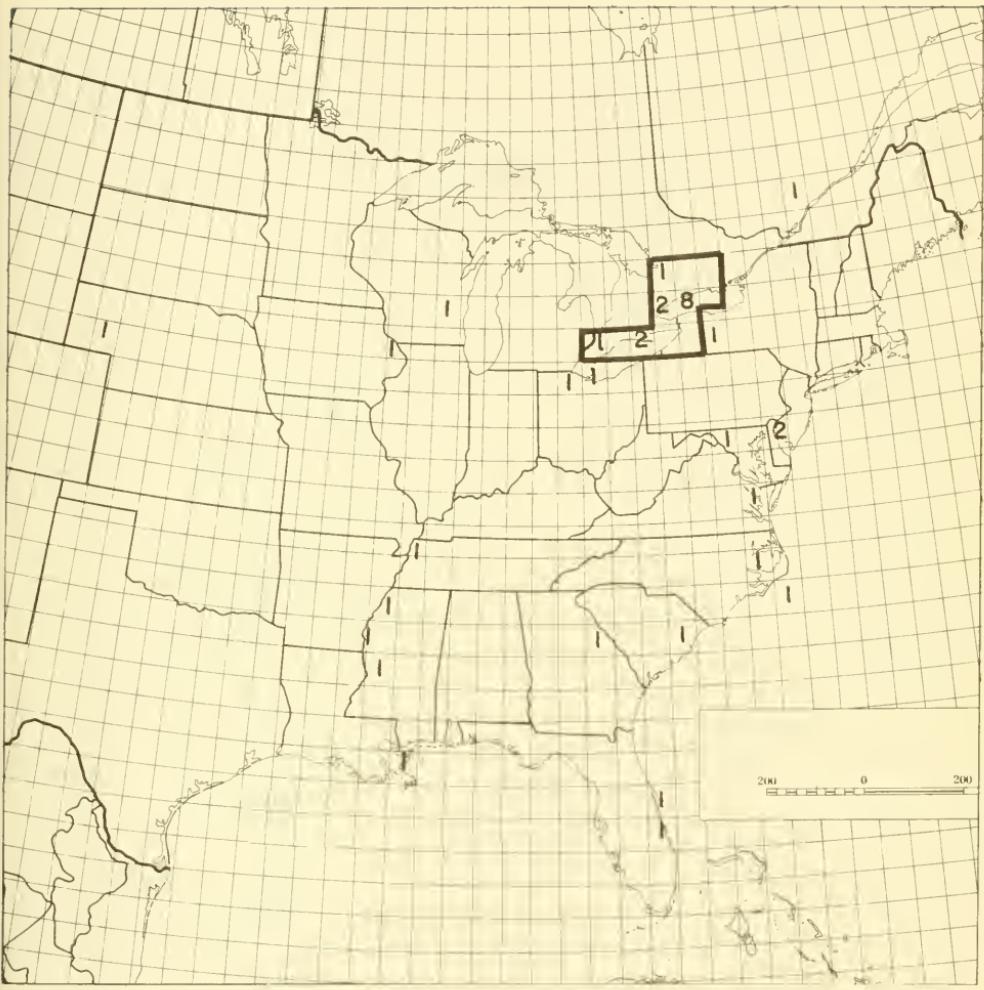


Figure A-6.--Recovery distribution of green-winged teal banded during the summer and fall in the western Lake Ontario reference area.

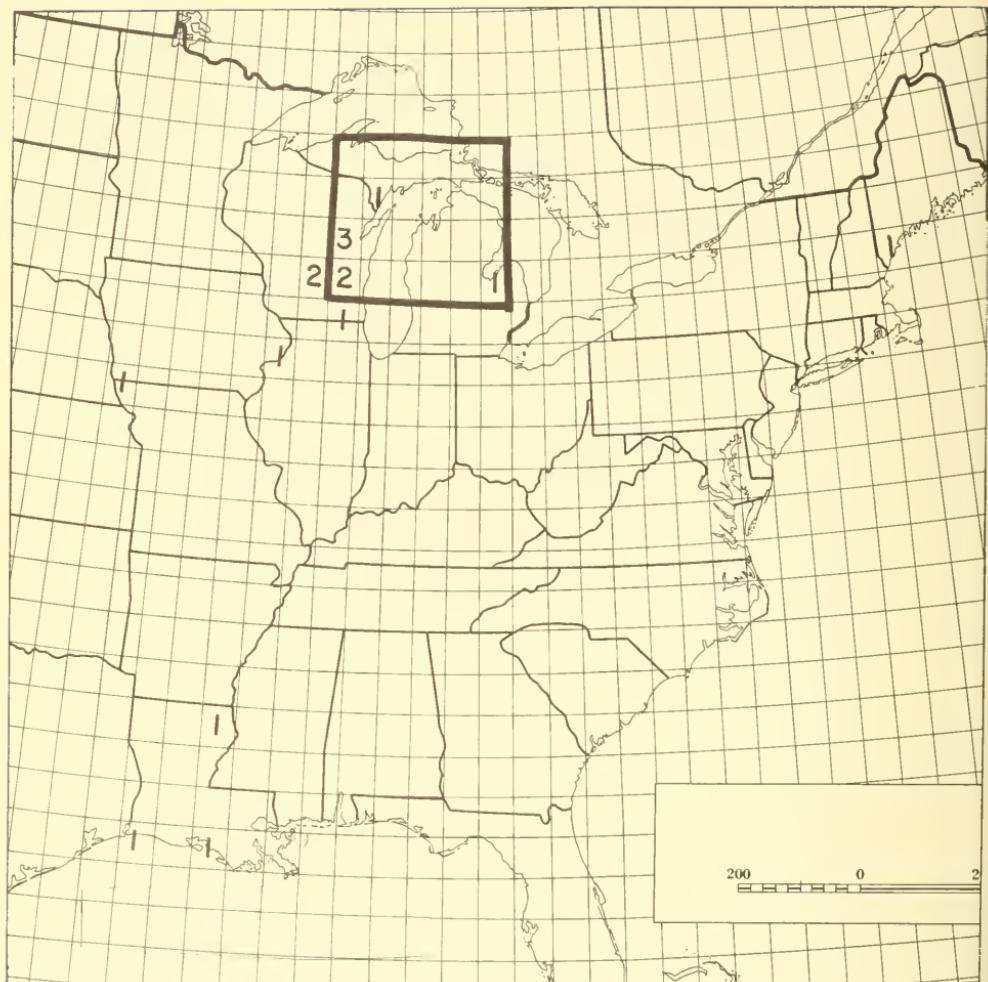


Figure A-7.--Recovery distribution of green-winged teal banded during the summer in the Upper Great Lakes reference area.

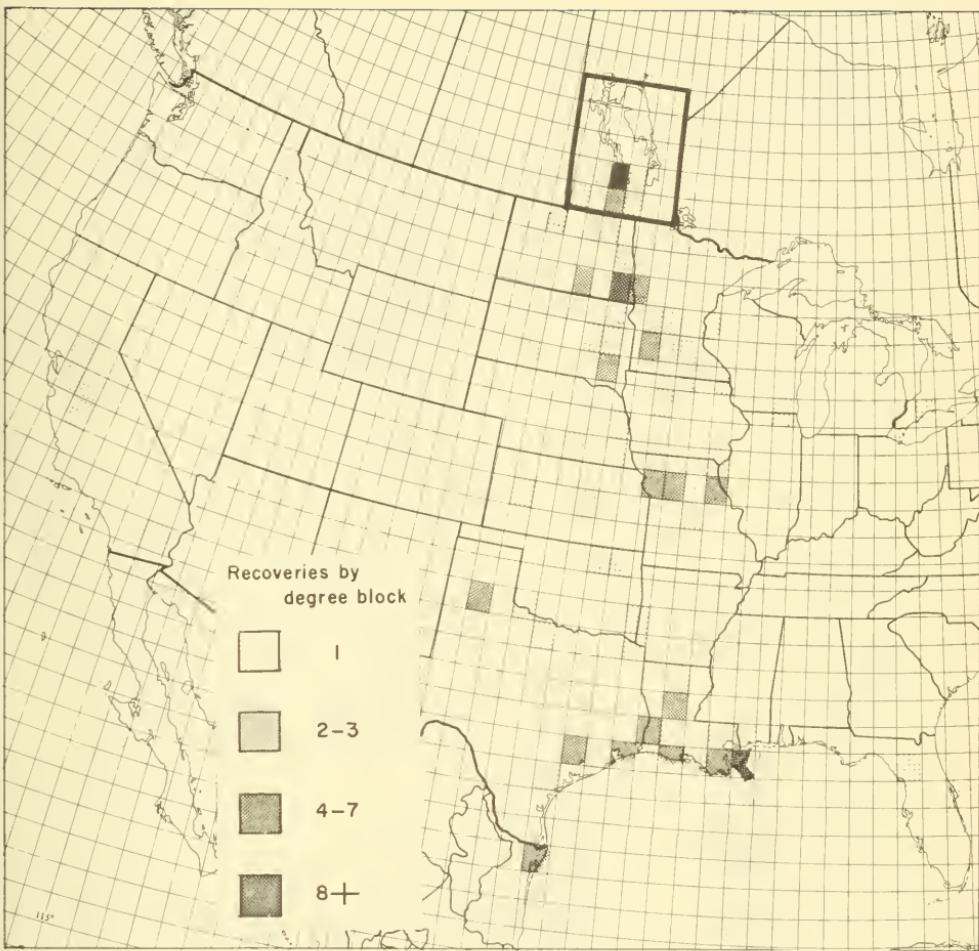


Figure A-8.--Recovery distribution of green-winged teal banded during the summer and September in Manitoba.

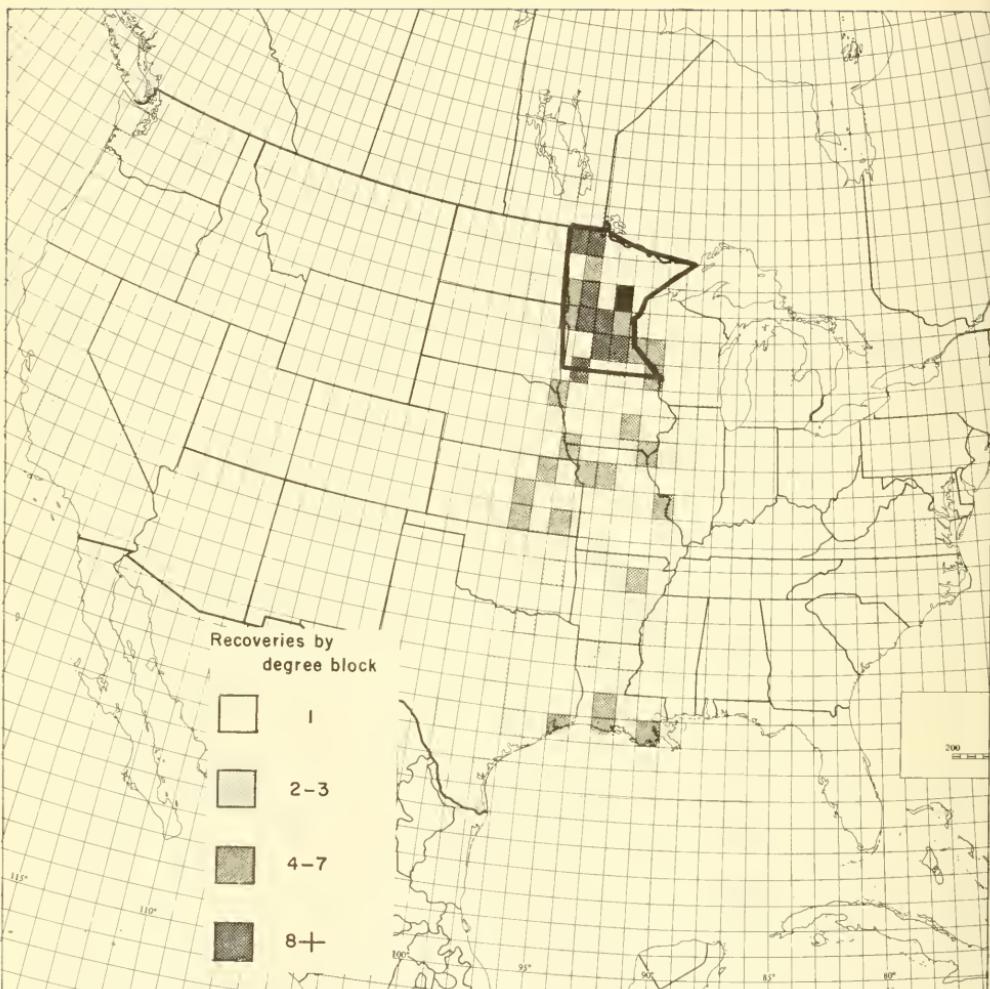


Figure A-9.--Recovery distribution of green-winged teal banded during the summer and fall in Minnesota.

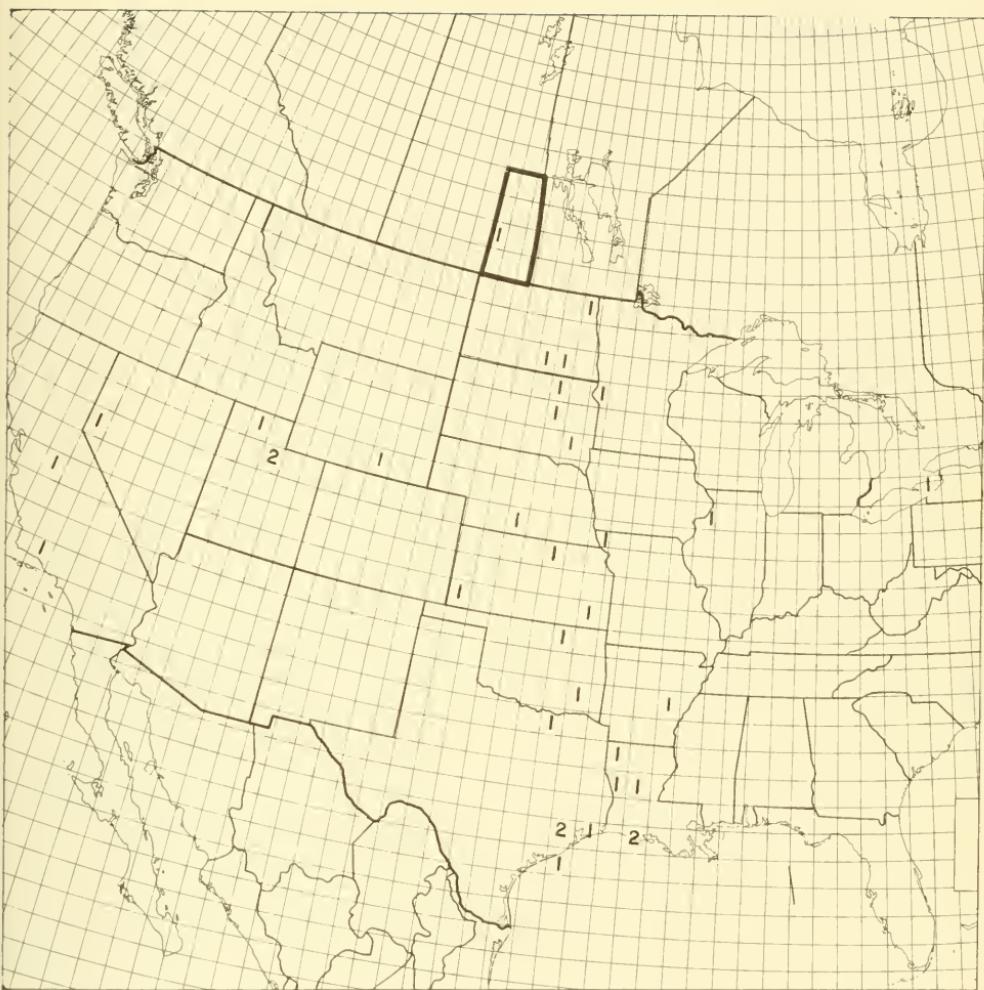


Figure A-10.--Recovery distribution of green-winged teal banded during the summer in southeastern Saskatchewan.

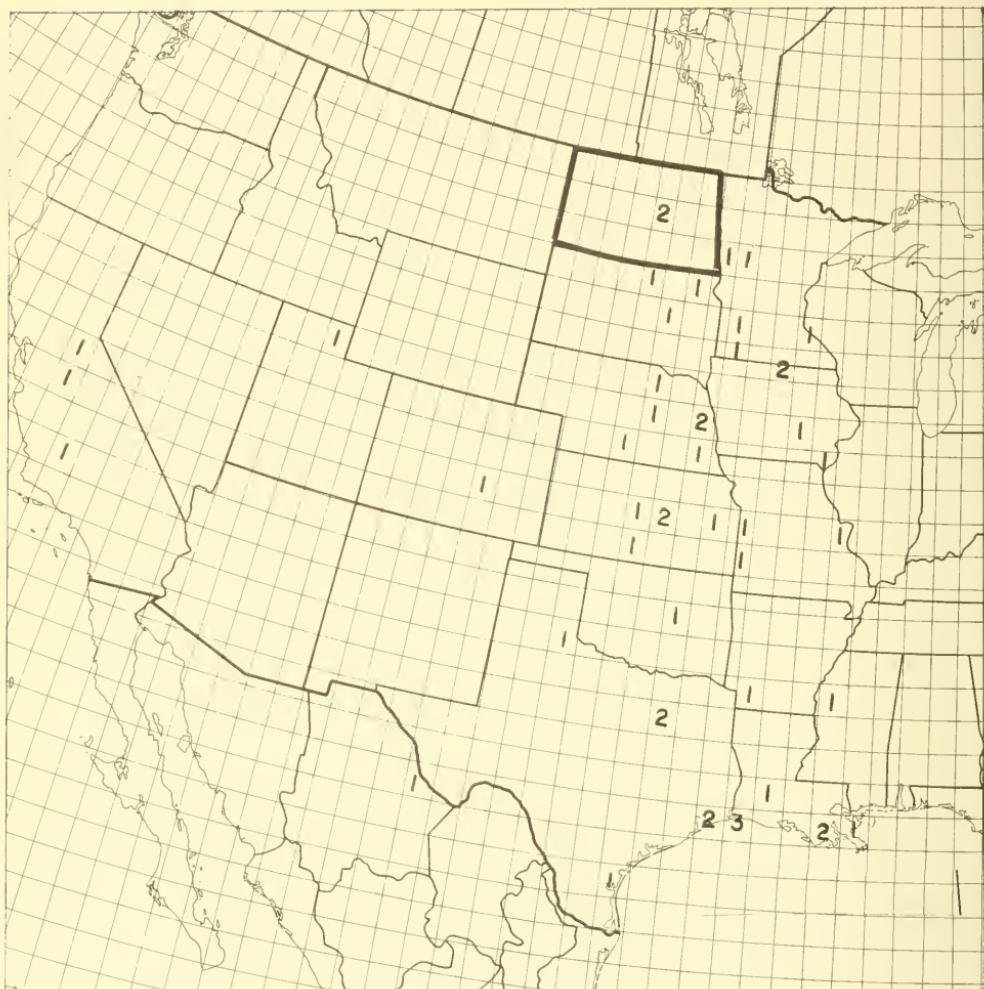


Figure A-11.--Recovery distribution of green-winged teal banded during the summer and fall in North Dakota.

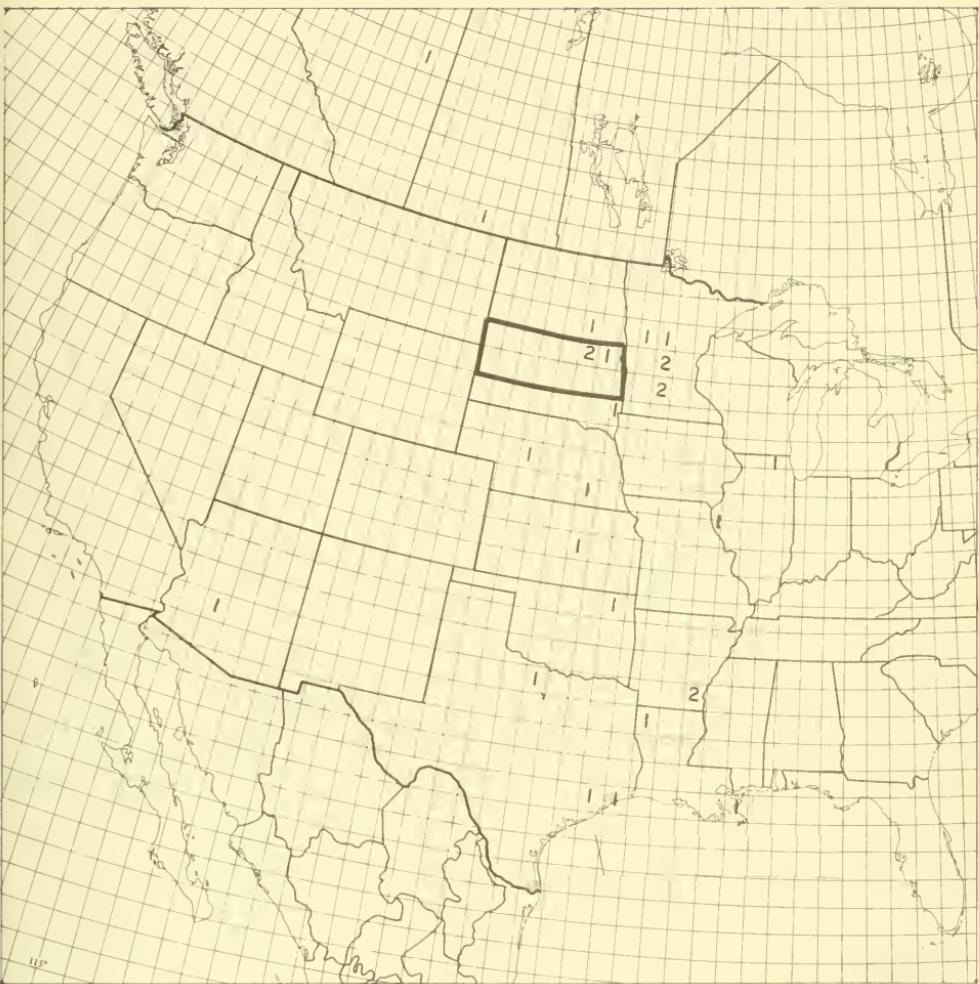


Figure A-12.--Recovery distribution of green-winged teal banded during the summer and fall in South Dakota.

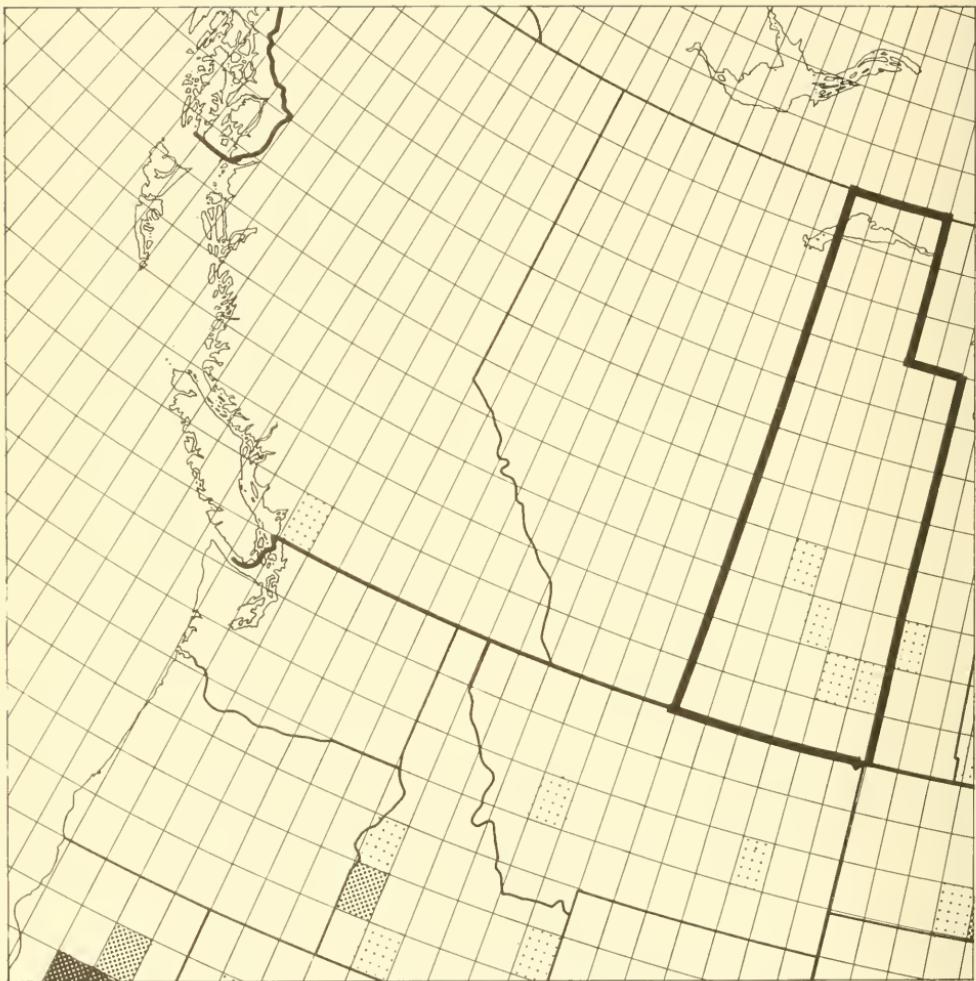


Figure A-13.--Recovery distribution of green-winged teal banded during the summer in Saskatchewan.

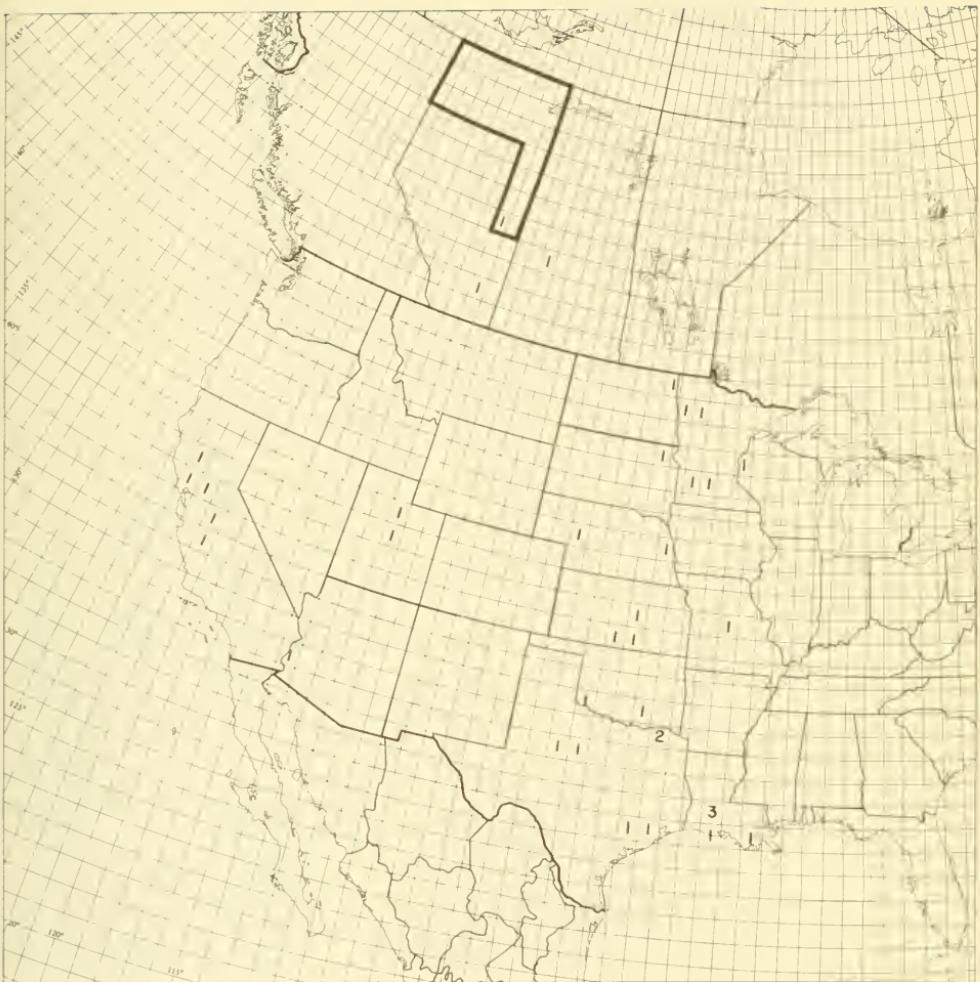


Figure A-14.--Recovery distribution of green-winged teal banded during the summer and September in northern Alberta.

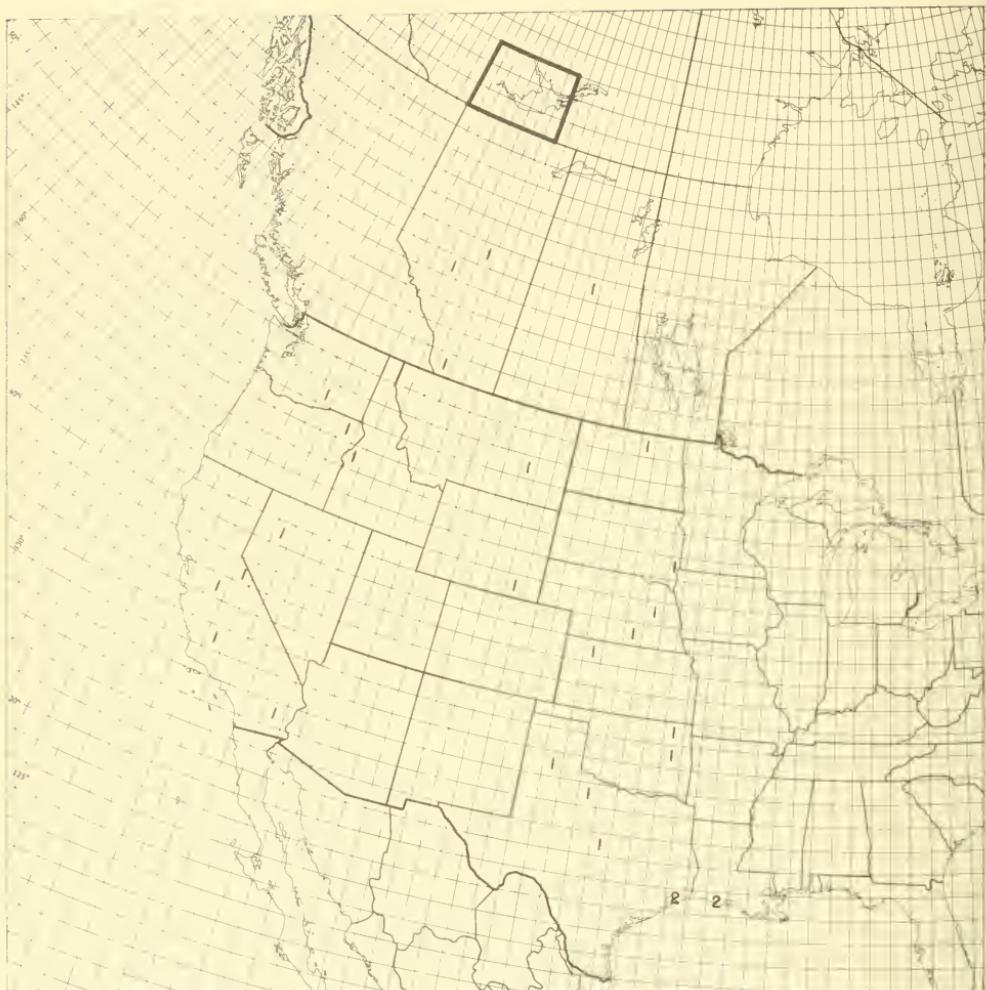


Figure A-15.--Recovery distribution of green-winged teal banded during the summer and September at Great Slave Lake, Mackenzie District.

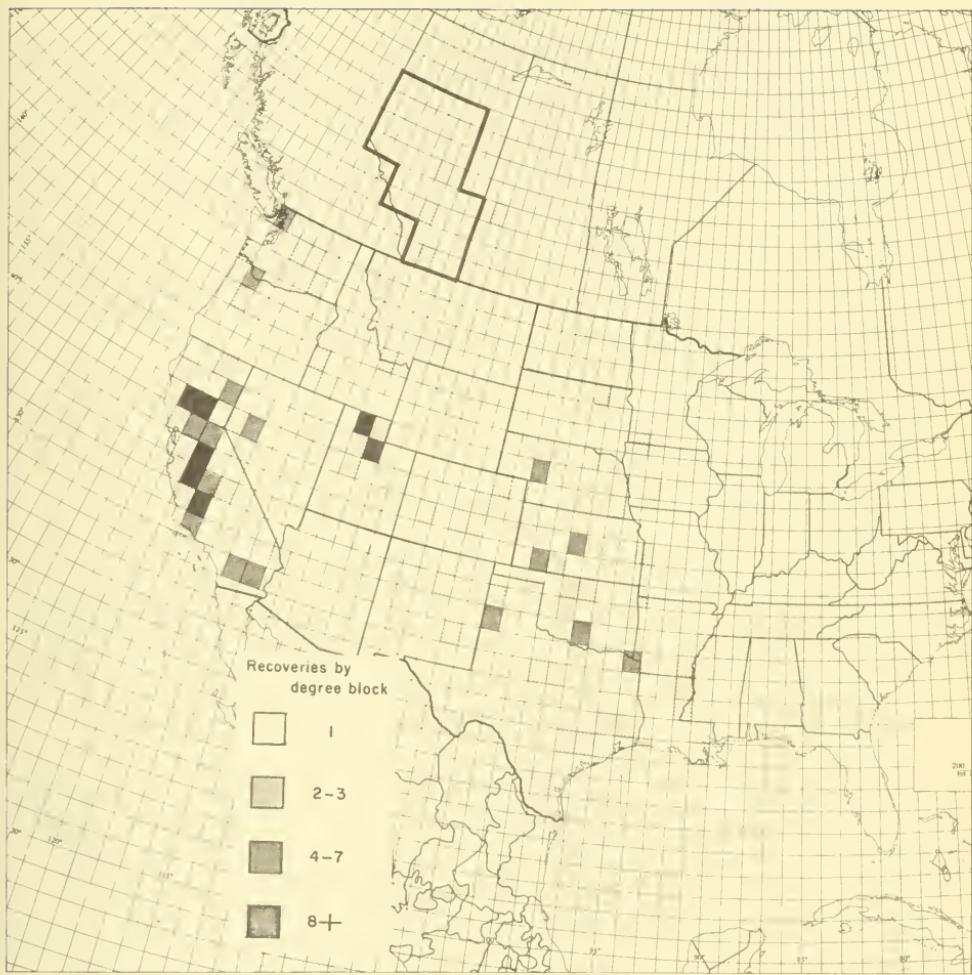


Figure A-16.--Recovery distribution of green-winged teal banded during the summer in central and southern Alberta.



Figure A-17.--Recovery distribution of green-winged teal banded during the summer in central Montana.

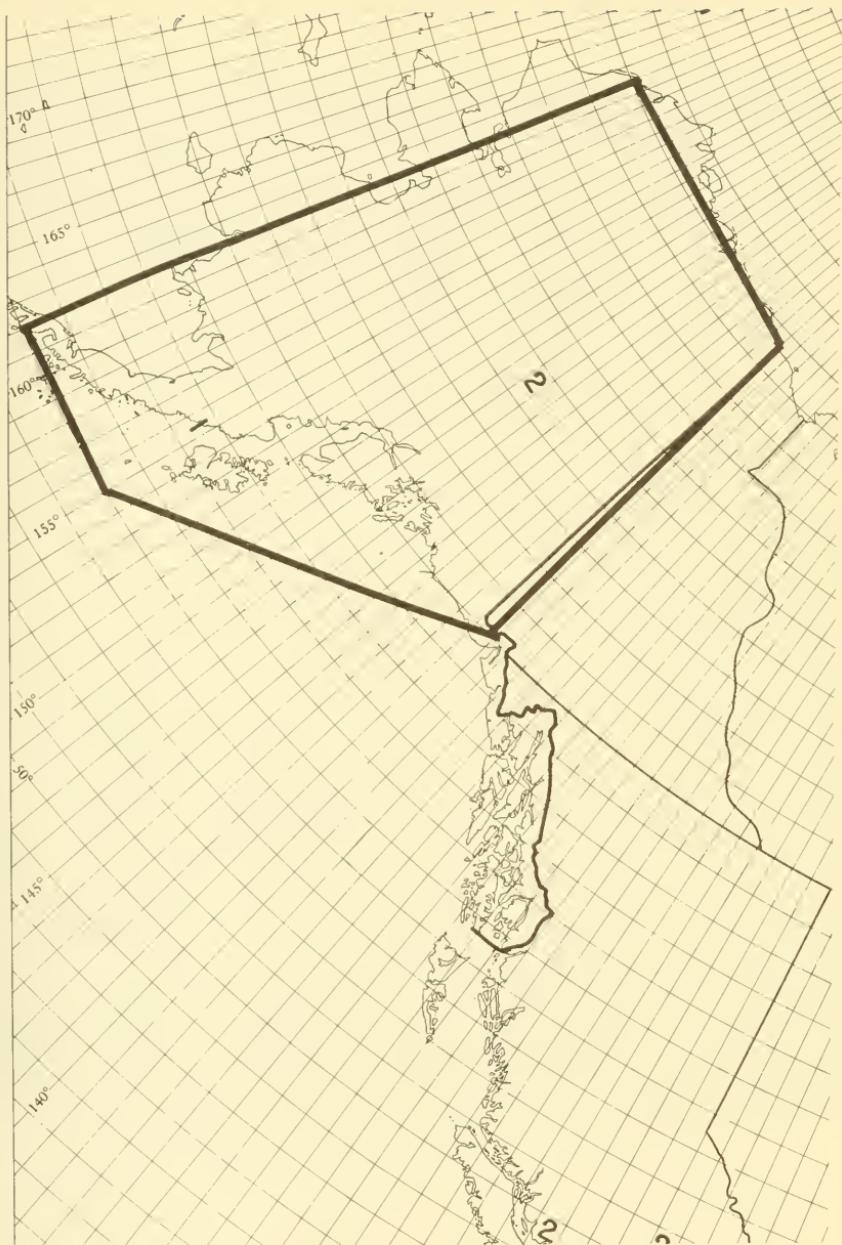


Figure A-18.--Recovery distribution of green-winged teal banded during the summer in Alaska.

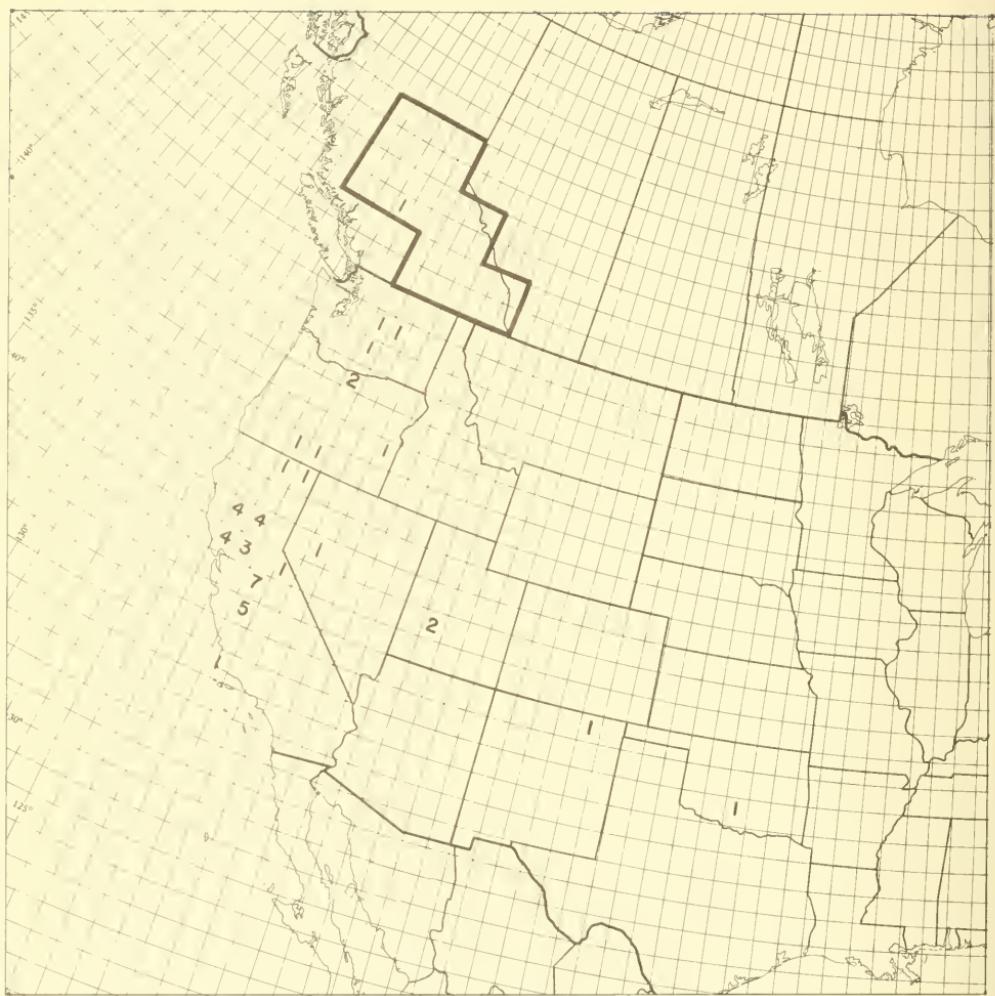


Figure A-19.--Recovery distribution of green-winged teal banded during the summer in central British Columbia.



Figure A-20.--Recovery distribution of green-winged teal banded during the summer in eastern Washington.

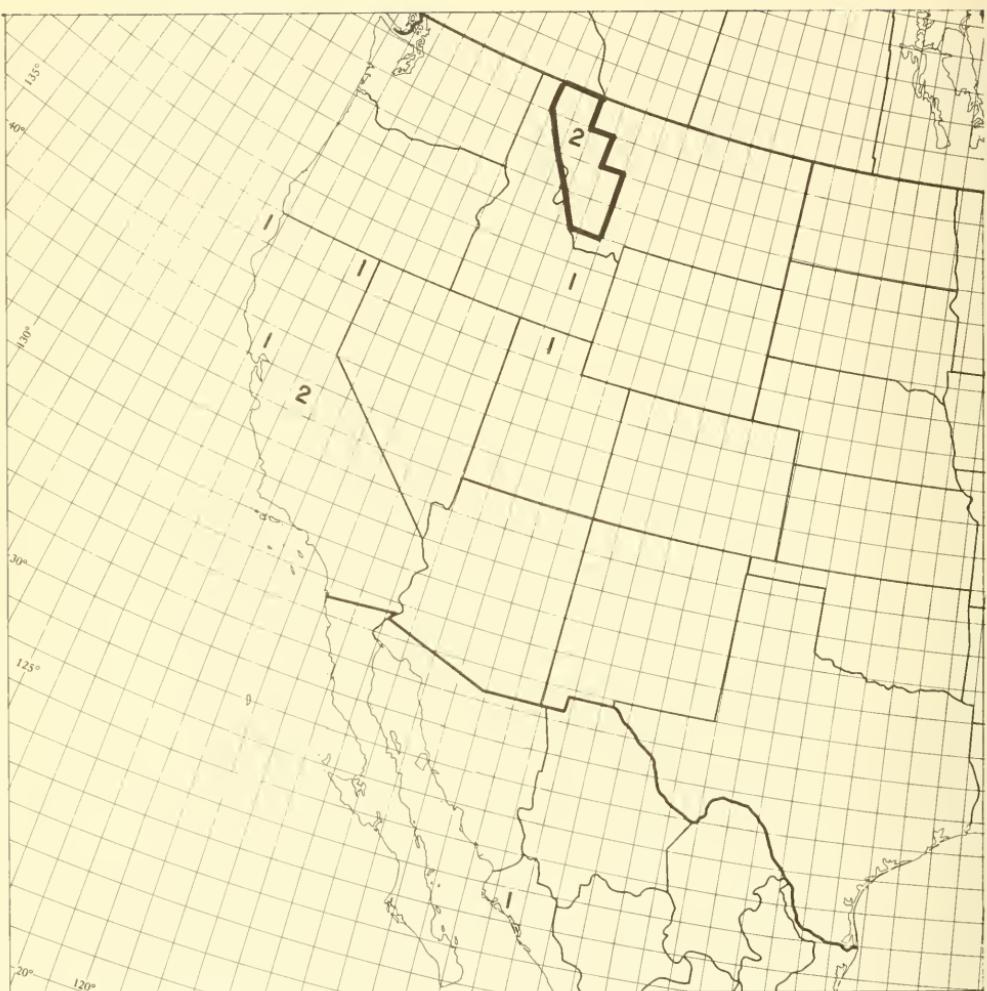


Figure A-21.--Recovery distribution of green-winged teal banded during the summer in western Montana.



Figure A-22.--Recovery distribution of green-winged teal banded during the summer in coastal Washington.

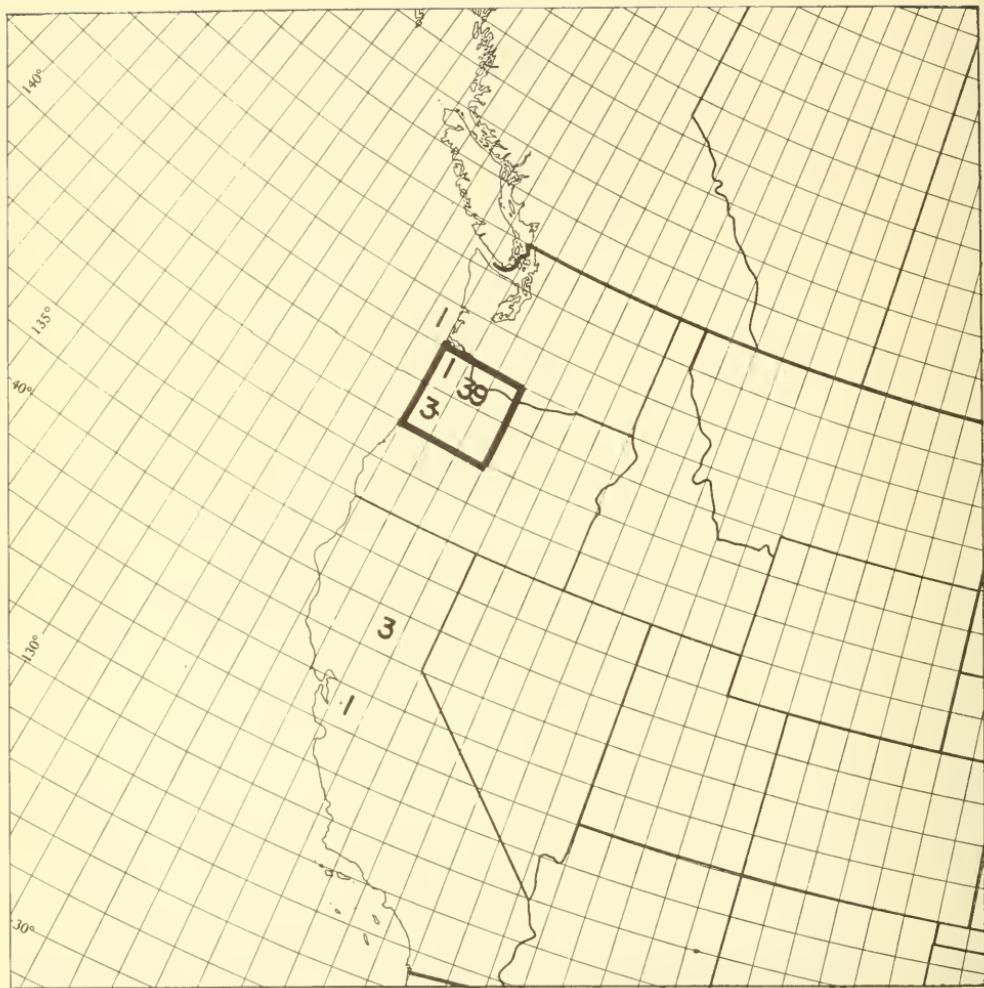


Figure A-23.--Recovery distribution of green-winged teal banded during the summer at Sauvie Island, Oregon.

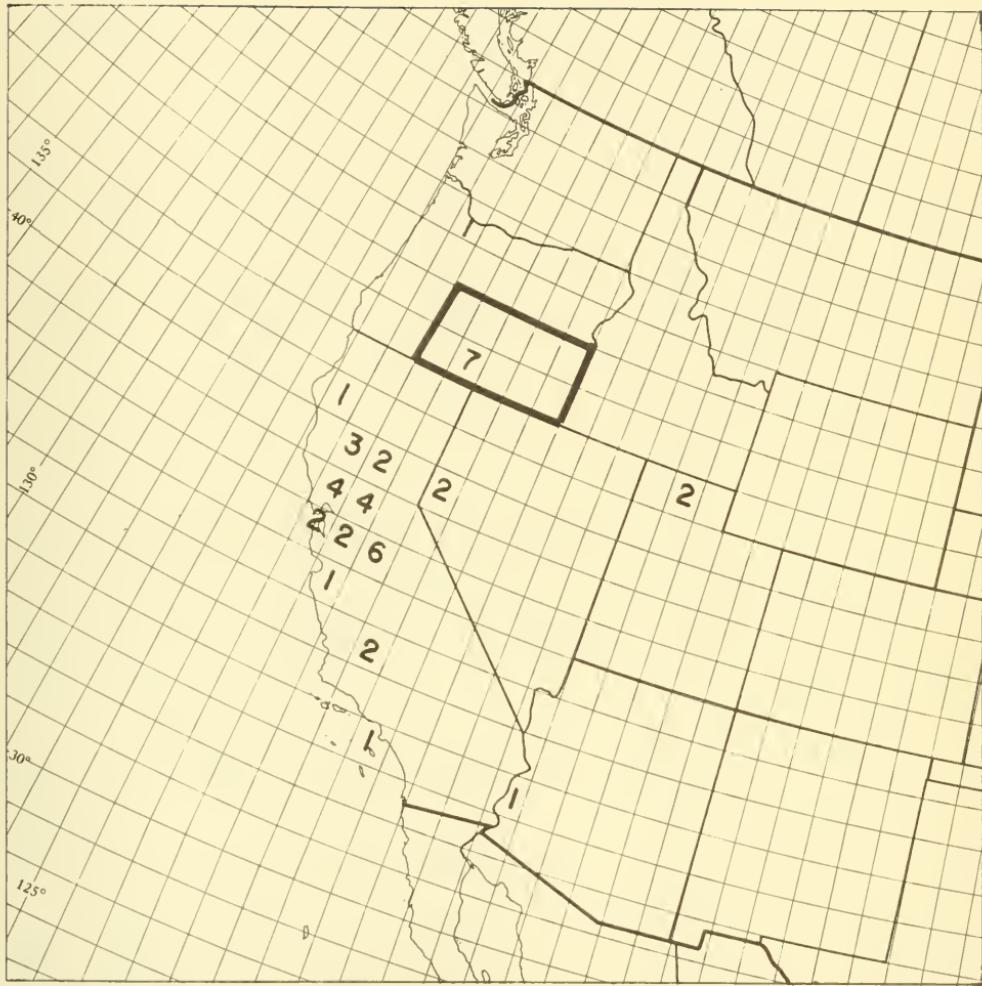


Figure A-24.--Recovery distribution of green-winged teal banded during the summer in interior Oregon.

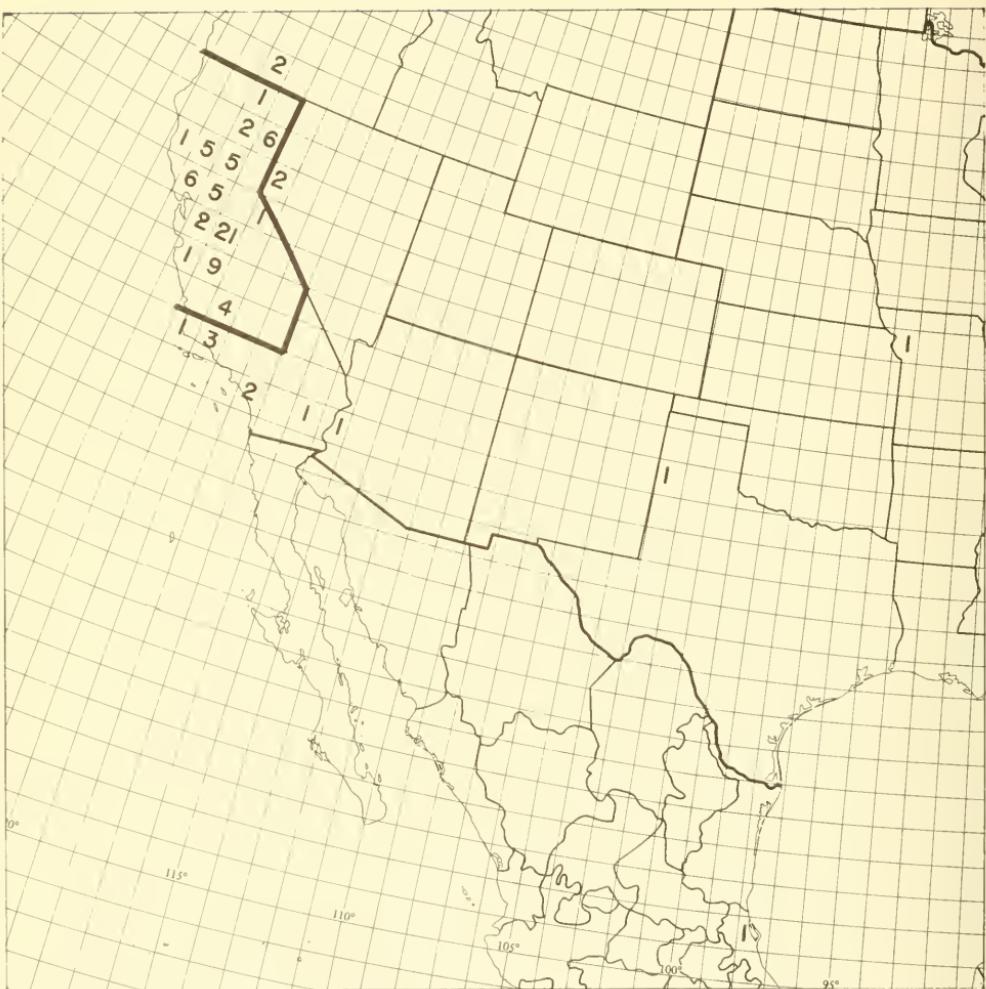


Figure A-25.--Recovery distribution of green-winged teal banded during the summer in central California.

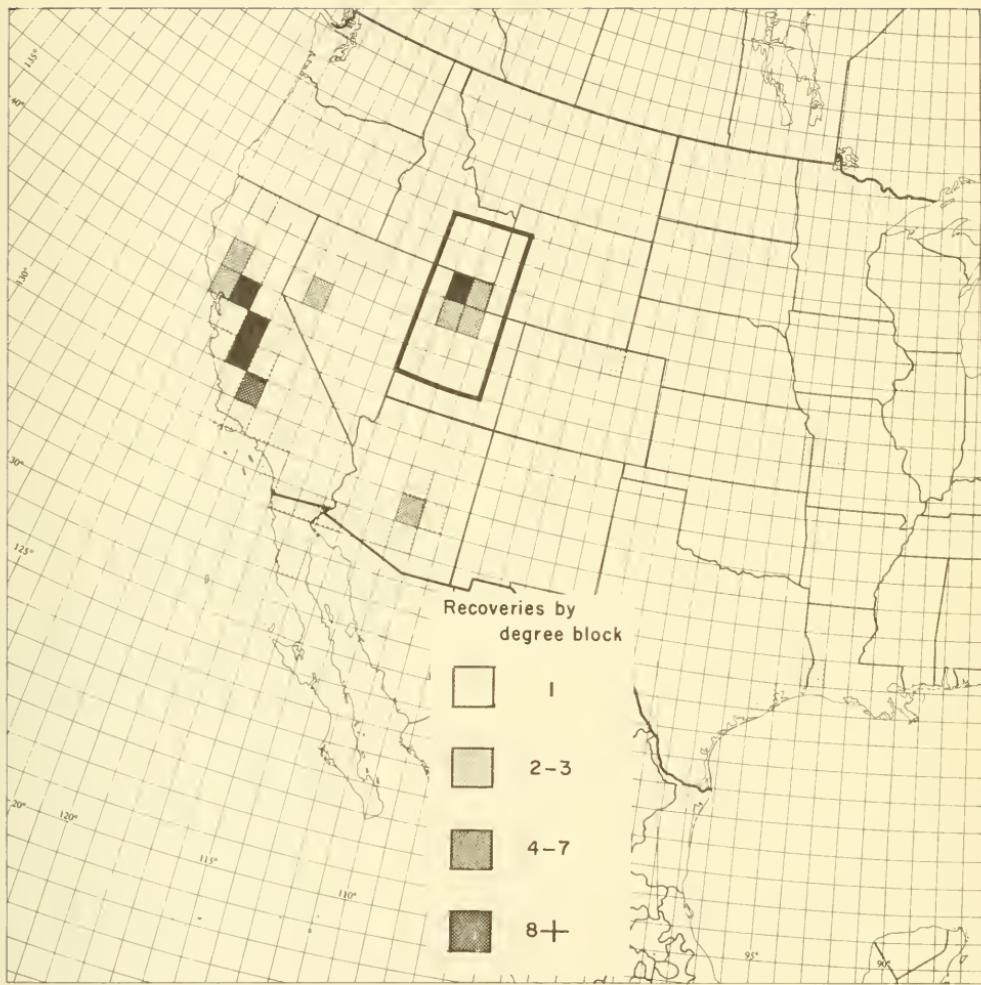


Figure A-26.--Recovery distribution of green-winged teal banded during the summer in Salt Lake Valley, Utah.



Figure A-27.--Recovery distribution of green-winged teal banded during the summer in Wyoming and Colorado.

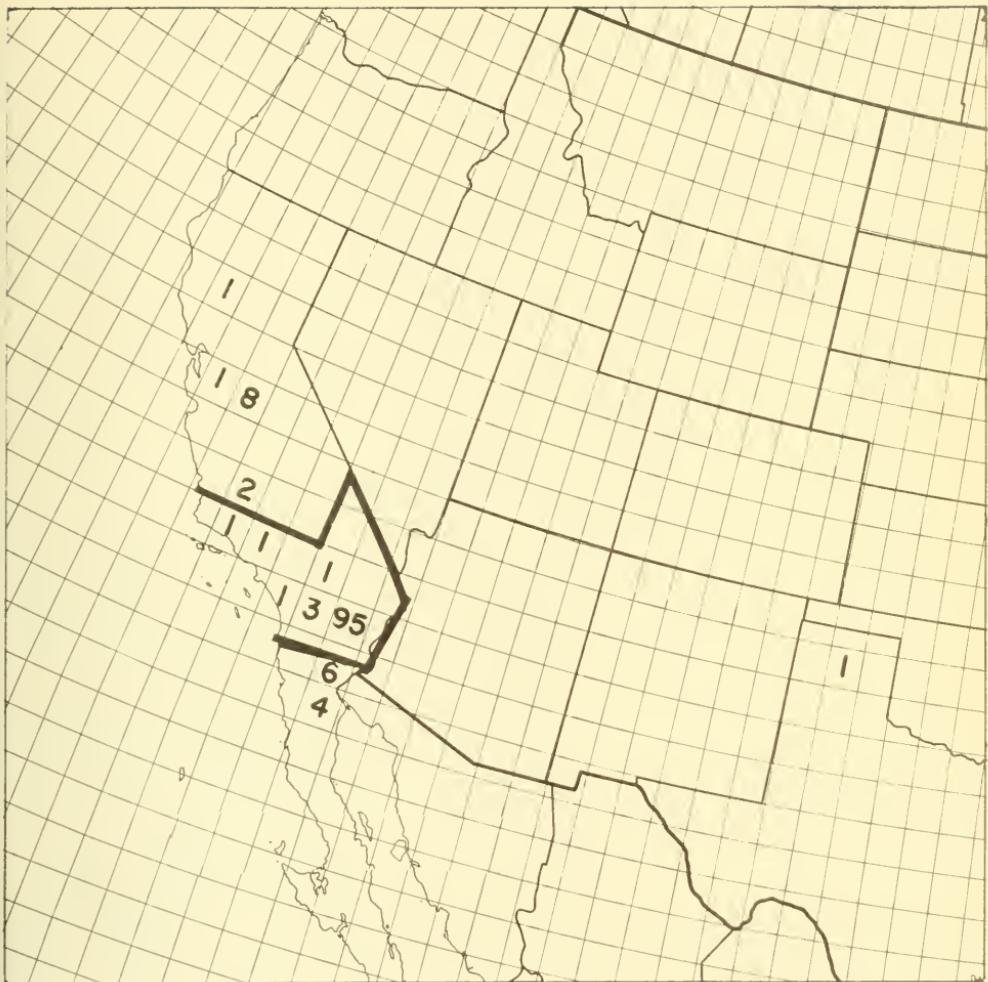


Figure A-28.--Recovery distribution of green-winged teal banded during the summer at Salton Sea, California.



Figure A-29.--Recovery distribution of green-winged teal banded during the summer in southern Nevada.

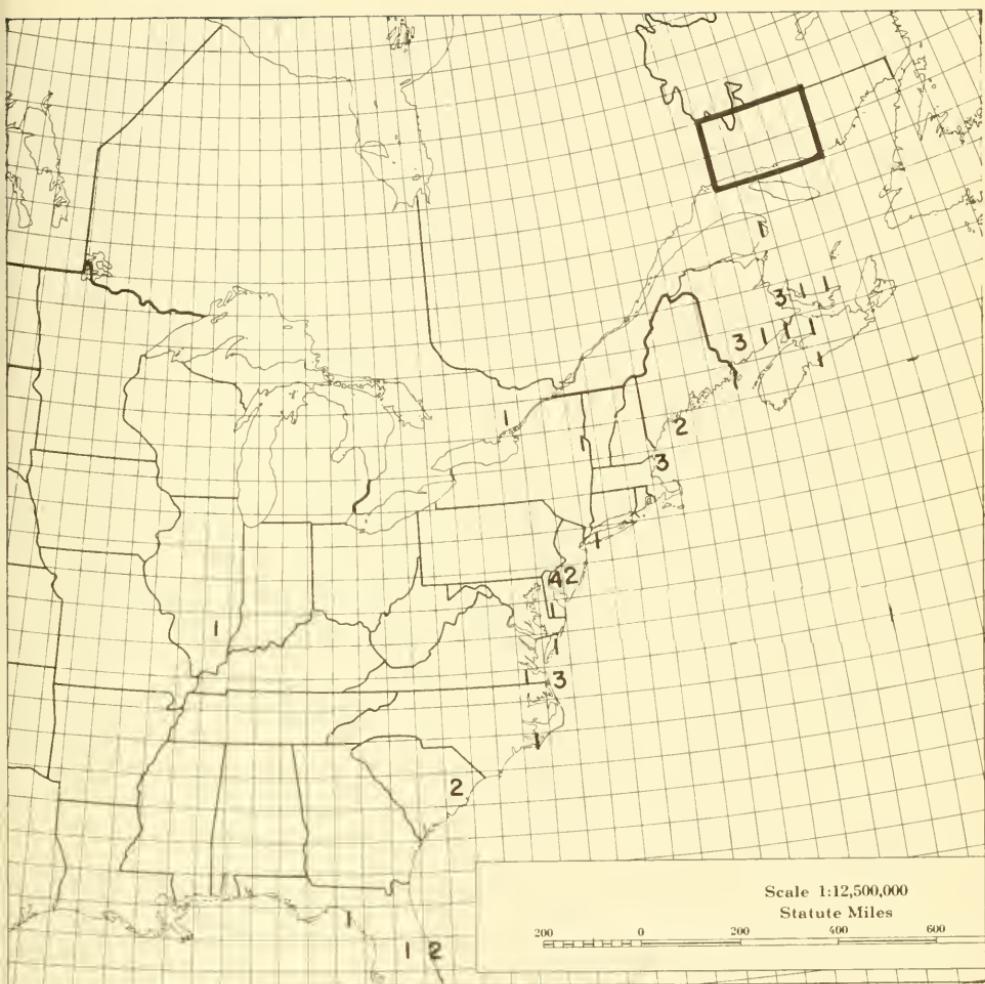


Figure A-30.--Recovery distribution of green-winged teal banded during October at Baie Johan Beetz, Quebec.

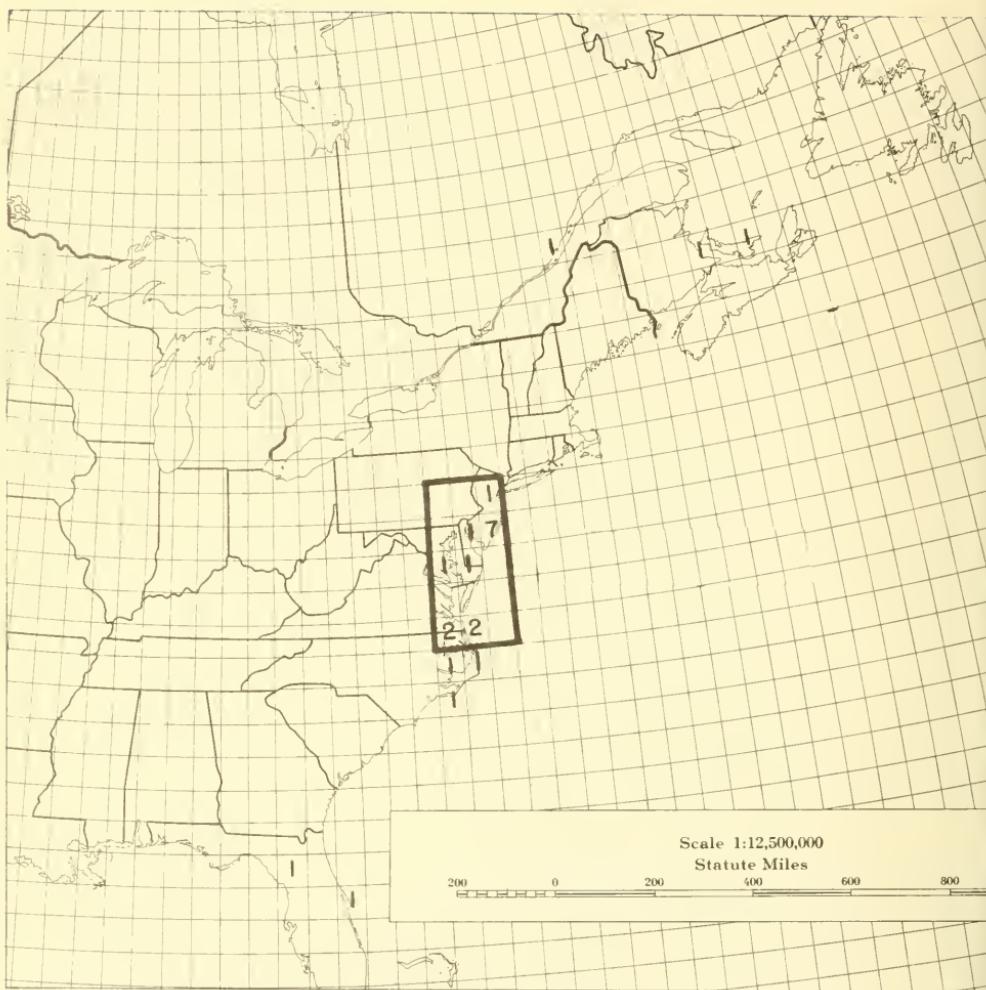


Figure A-31.--Recovery distribution of green-winged teal banded during the fall in the Mid-Atlantic States.

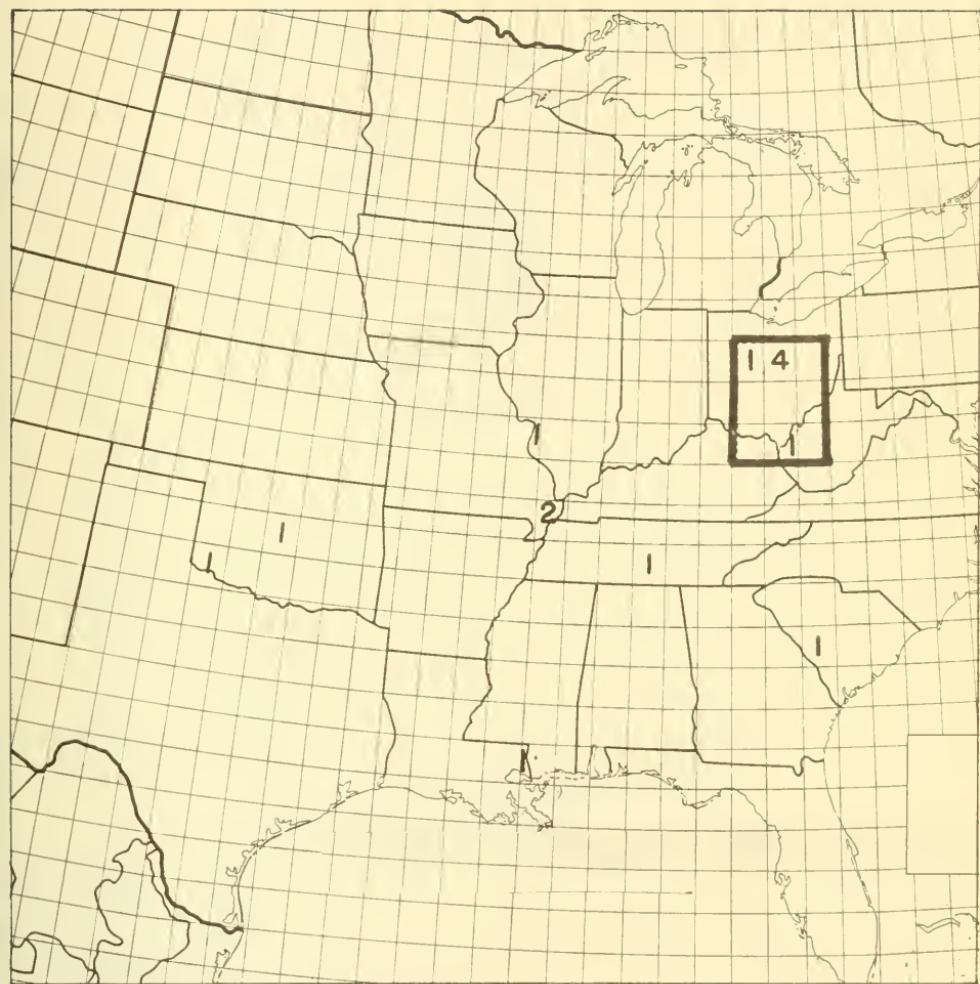


Figure A-32.--Recovery distribution of green-winged teal banded during the fall in Ohio and West Virginia.

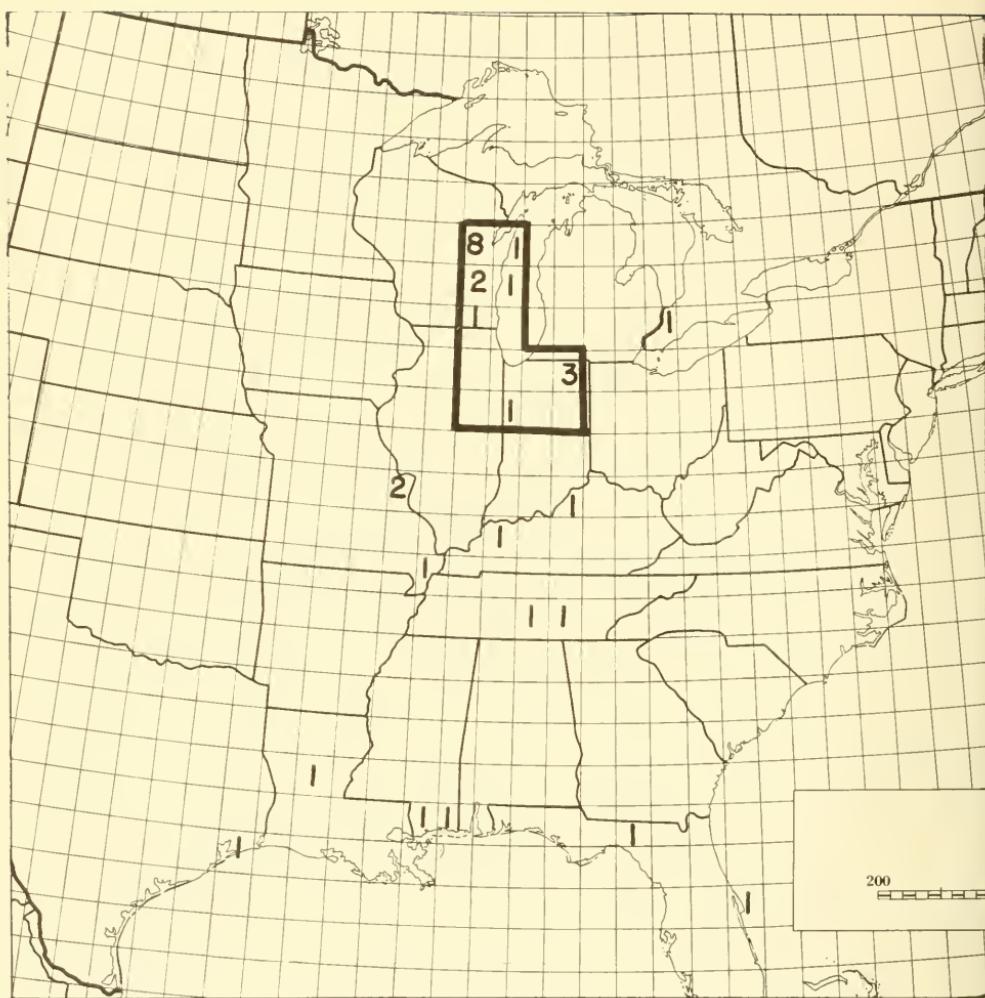


Figure A-33.--Direct recovery distribution of green-winged teal banded during the fall in the Lake Michigan area.

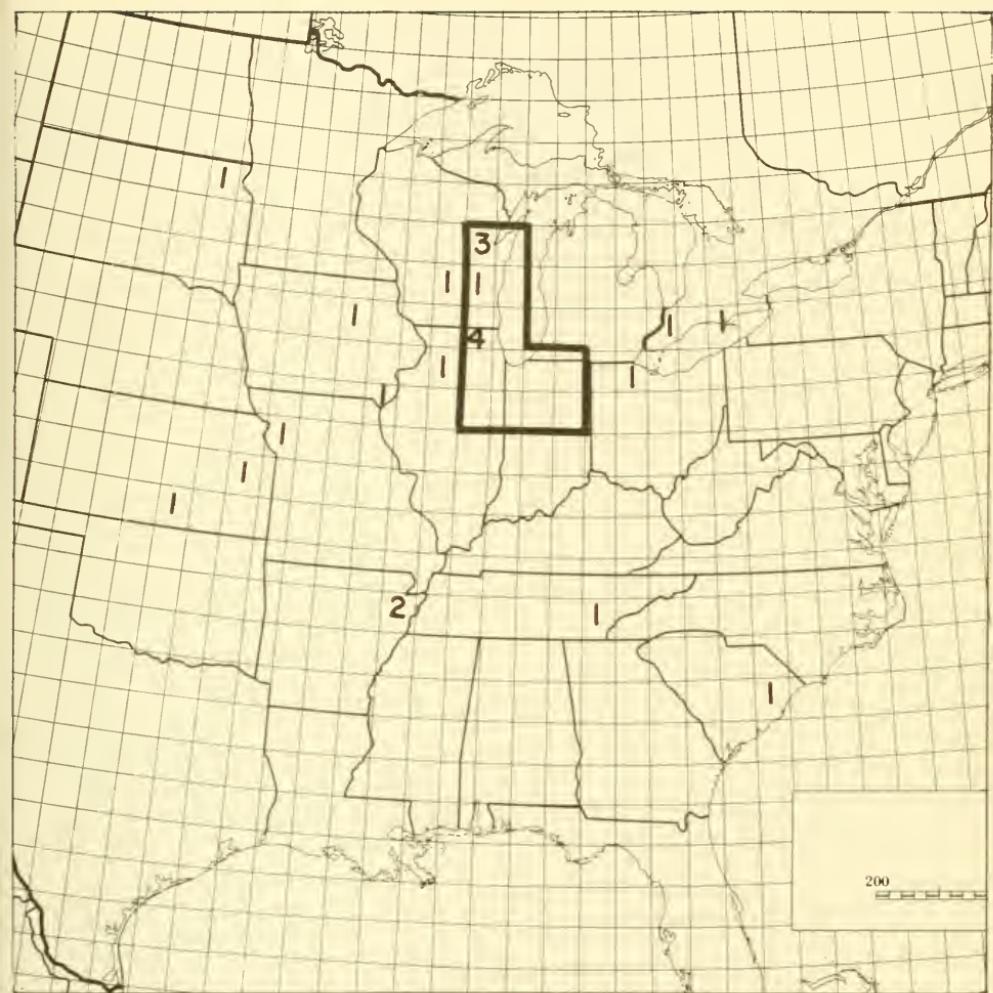


Figure A-34. Indirect recovery distribution of green-winged teal banded during the fall in the Lake Michigan area.

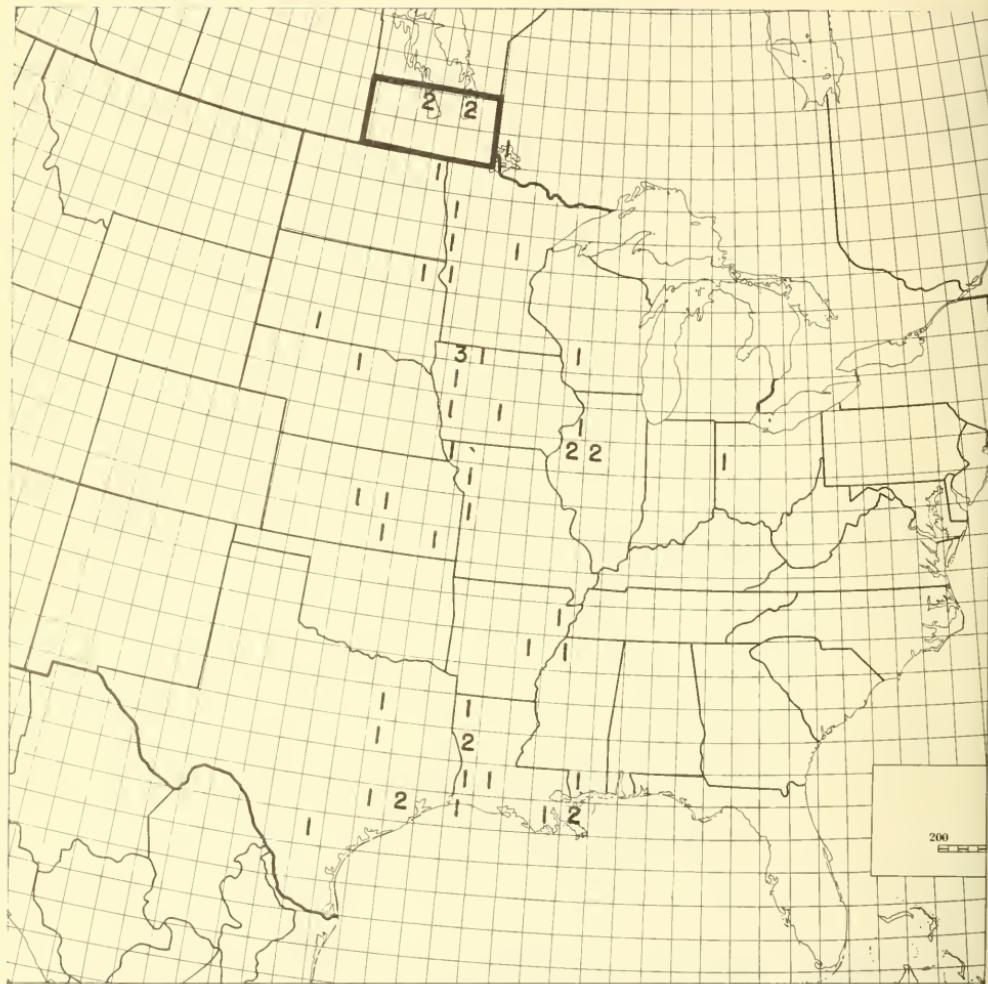


Figure A-35.--Recovery distribution of green-winged teal banded during October in Manitoba.

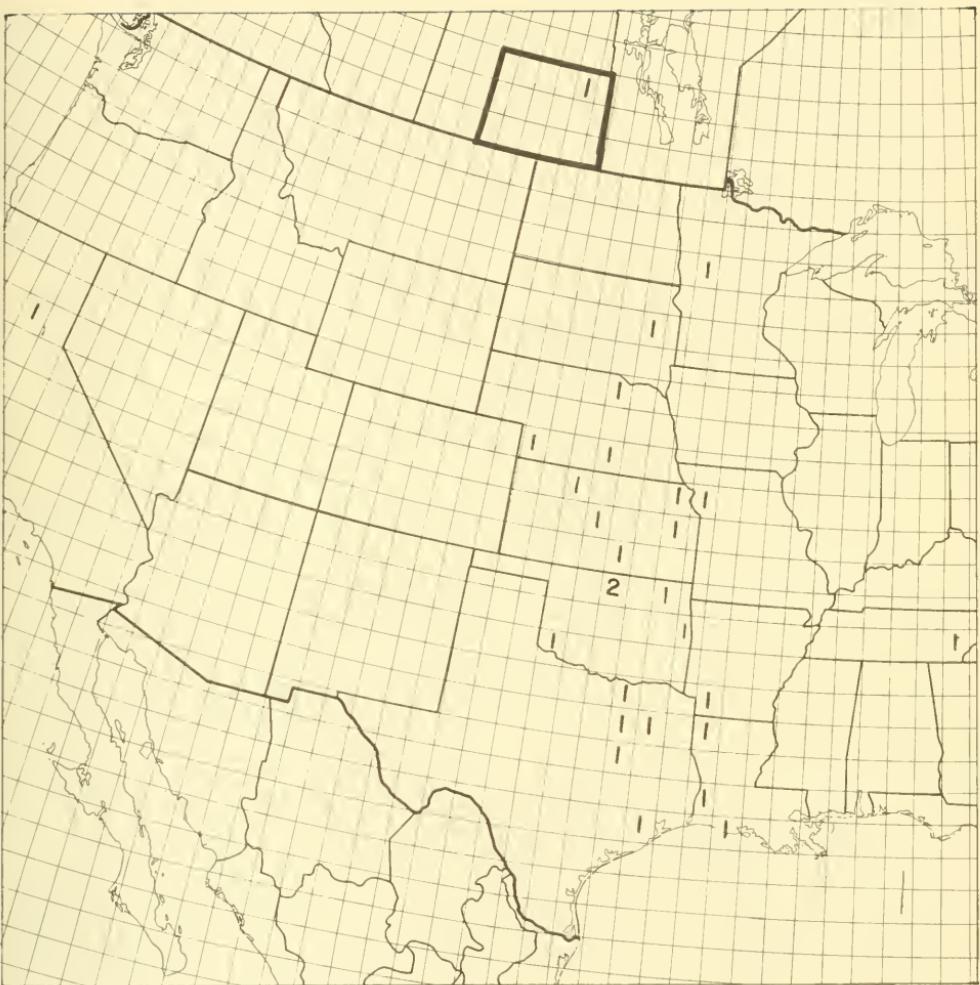


Figure A-36.--Recovery distribution of green-winged teal banded during September and October in southern Saskatchewan.

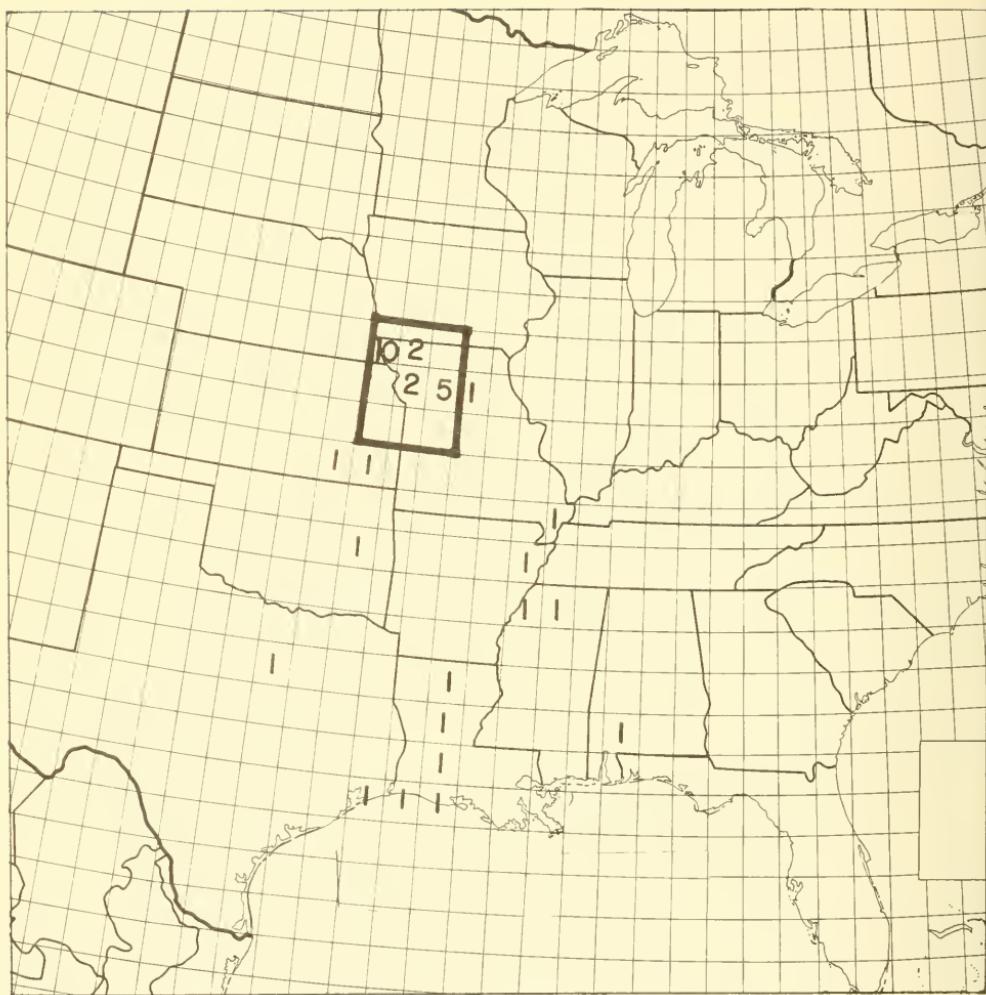


Figure A-37.--Direct recovery distribution of green-winged teal banded during the fall in Missouri.

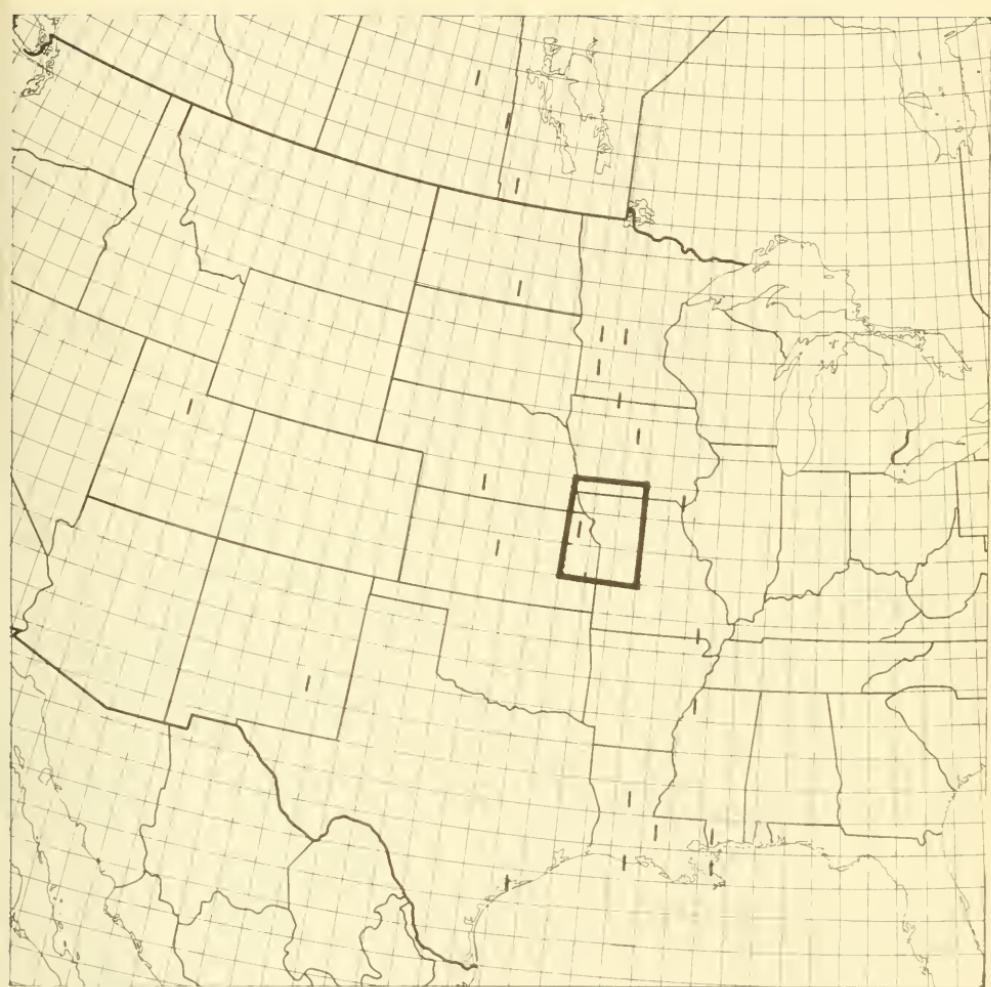


Figure A-38.--Indirect recovery distribution of green-winged teal banded during the fall in Missouri.

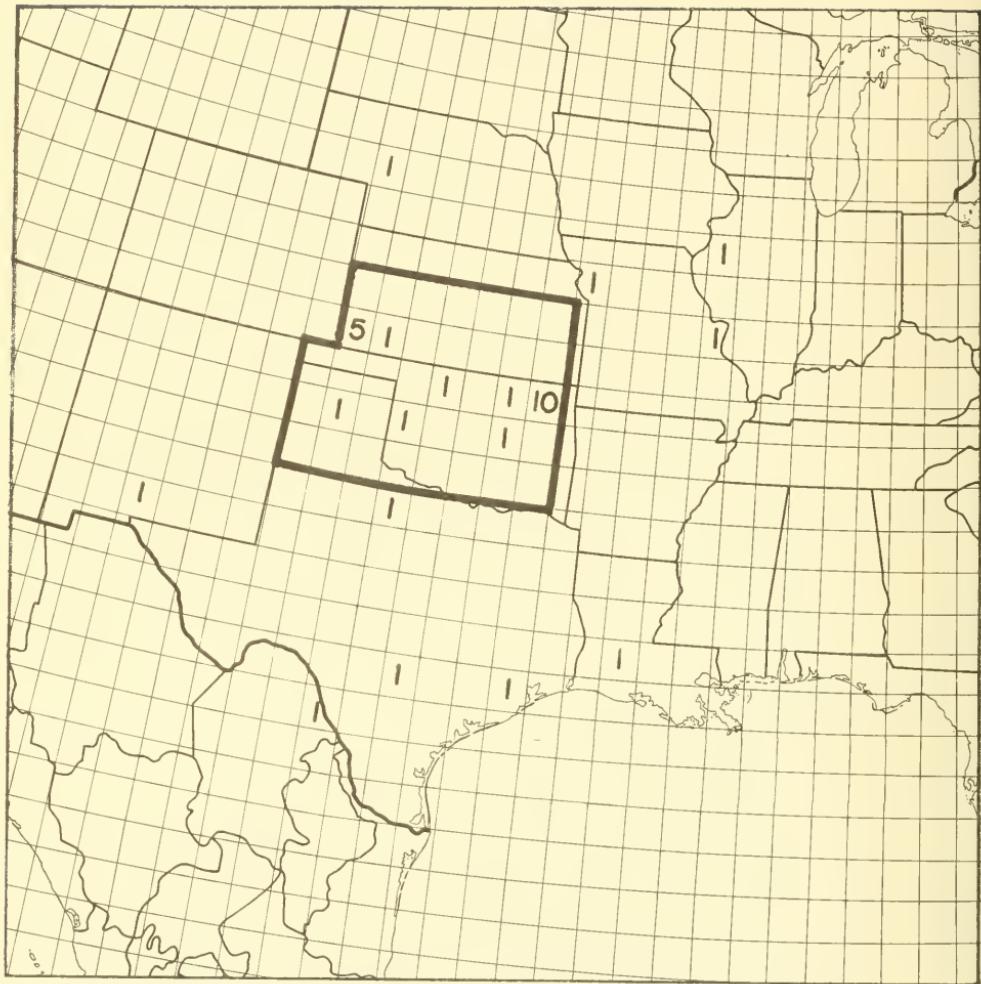
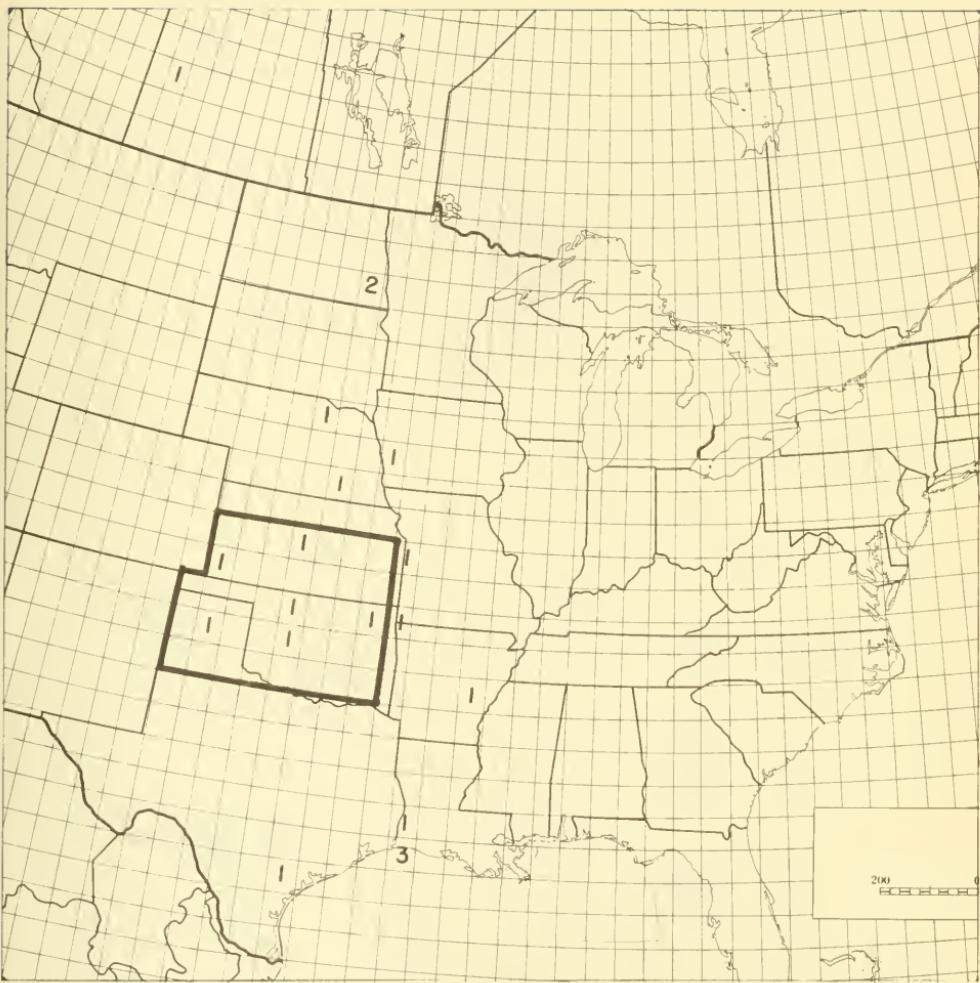


Figure A-39.--Direct recovery distribution of green-winged teal banded during the fall in Kansas, Oklahoma and northern Texas.



A-40.--Indirect recovery distribution of green-winged teal banded during the fall in Kansas, Oklahoma and northern Texas.

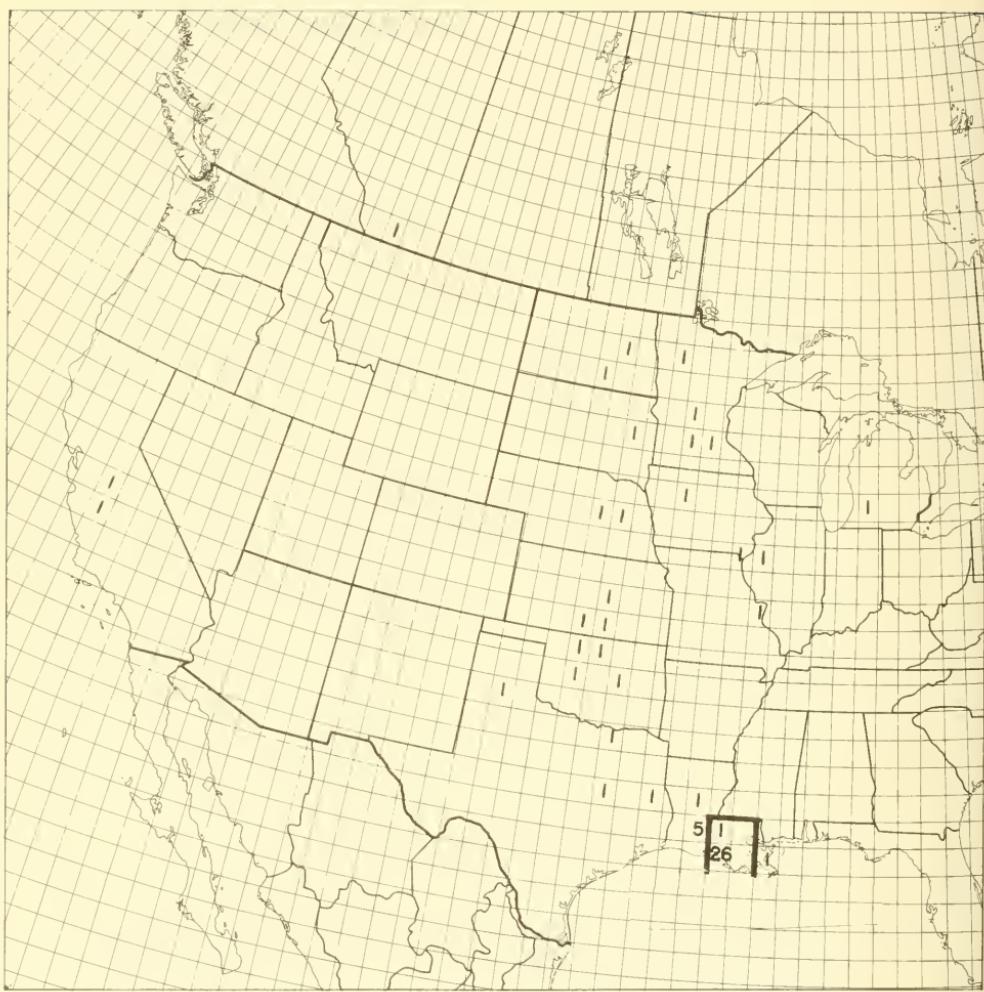


Figure A-41.--Recovery distribution of green-winged teal banded during the fall in Louisiana.

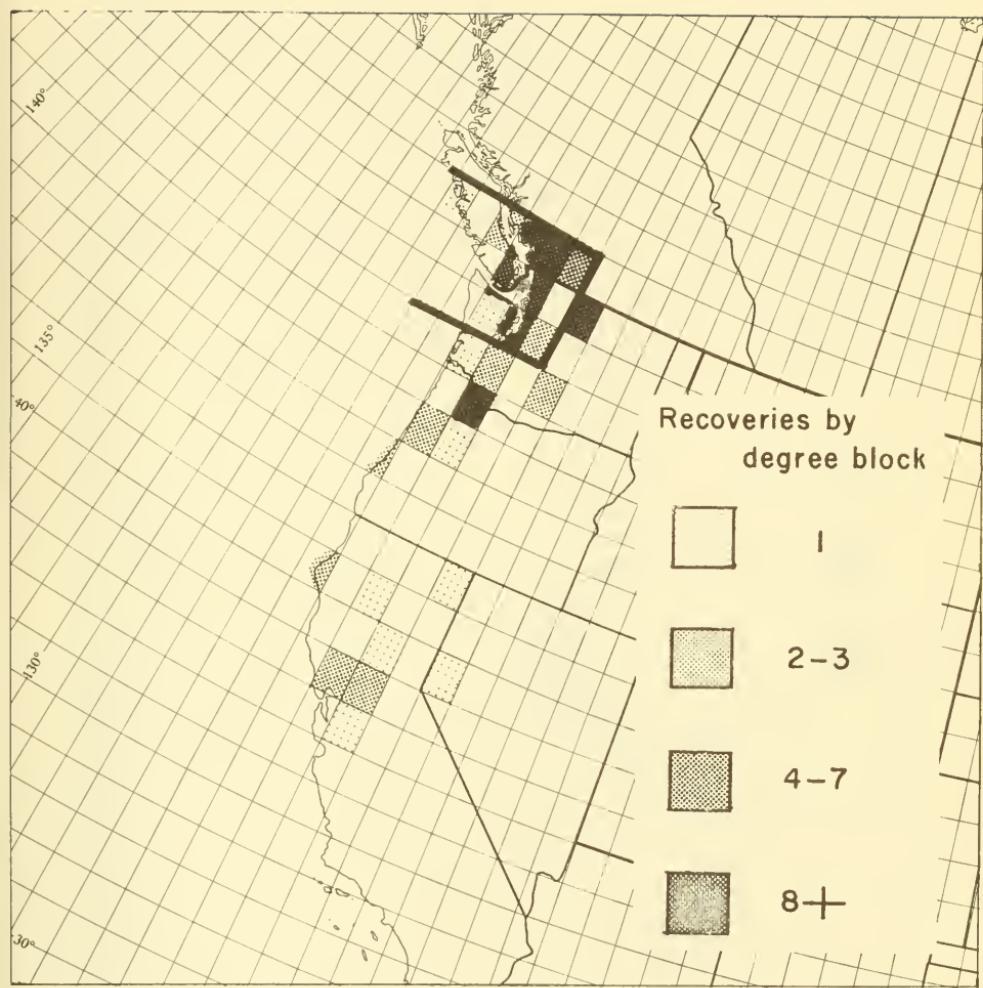


Figure A-42.--Direct recovery distribution of green-winged teal banded during the fall in the Puget Sound area.

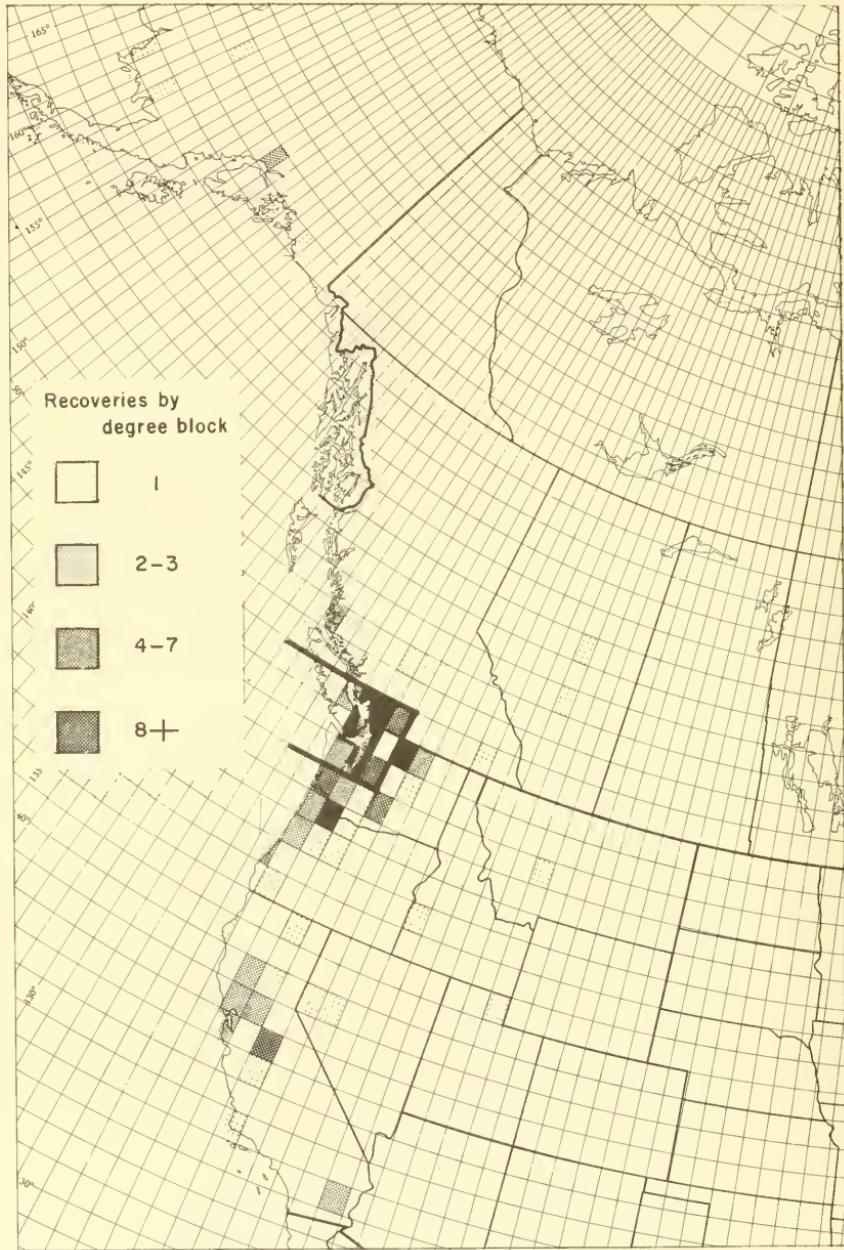


Figure A-43---Indirect recovery distribution of green-winged teal banded during the fall in the Puget Sound area.

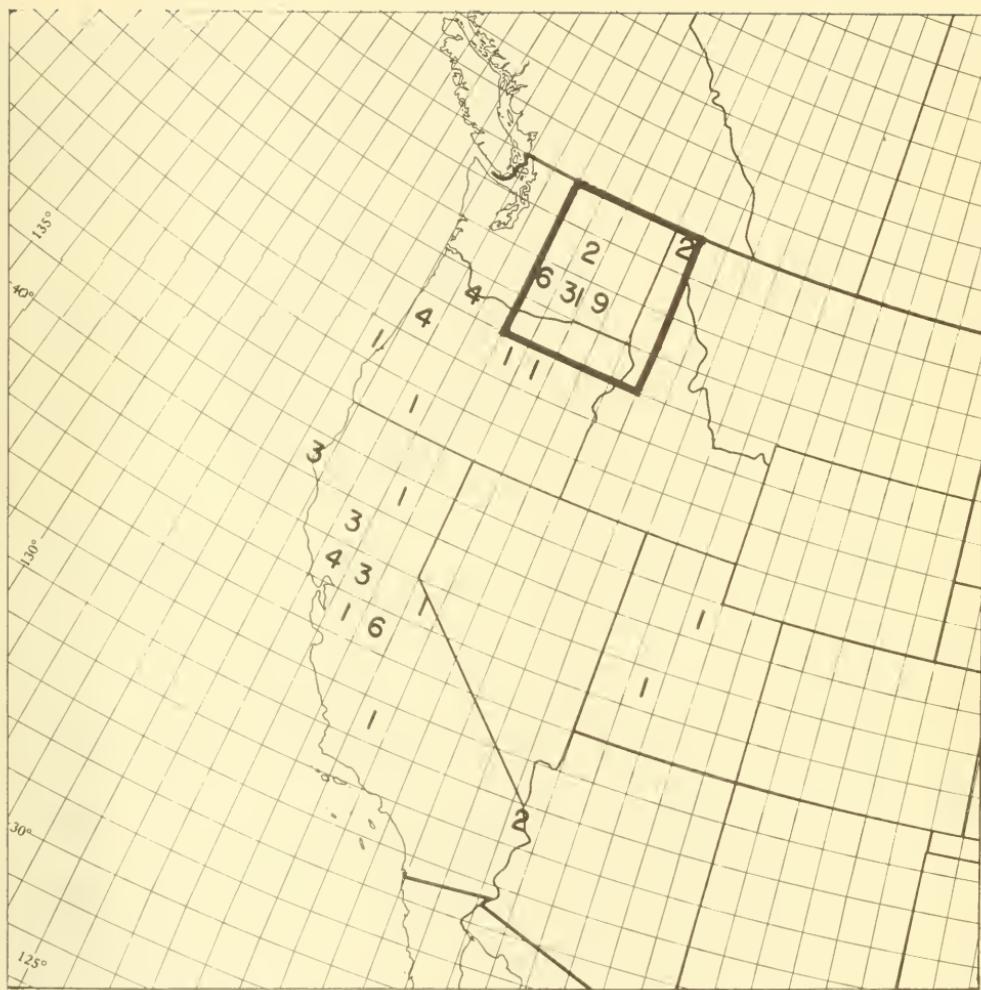


Figure A-44.--Direct recovery distribution of green-winged teal banded during the fall in eastern Washington.

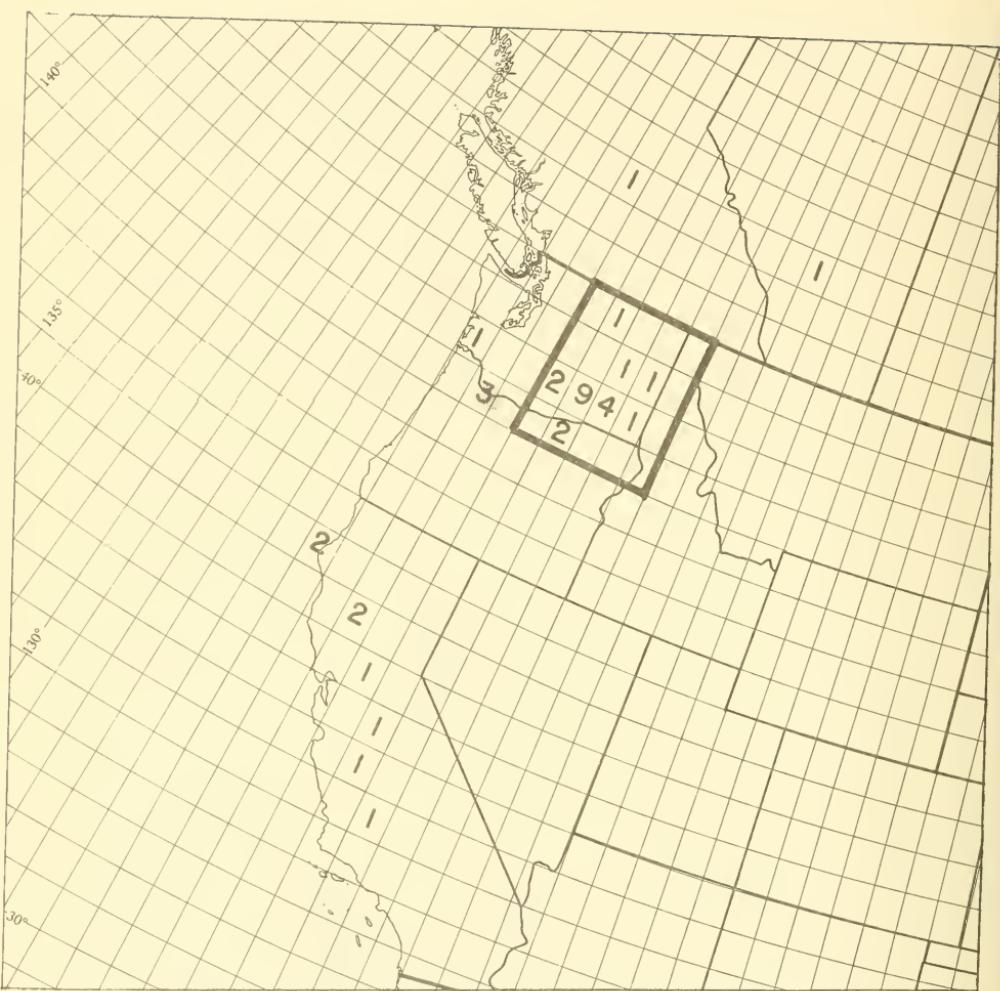


Figure A-45.--Indirect recovery distribution of green-winged teal banded during the fall in eastern Washington.

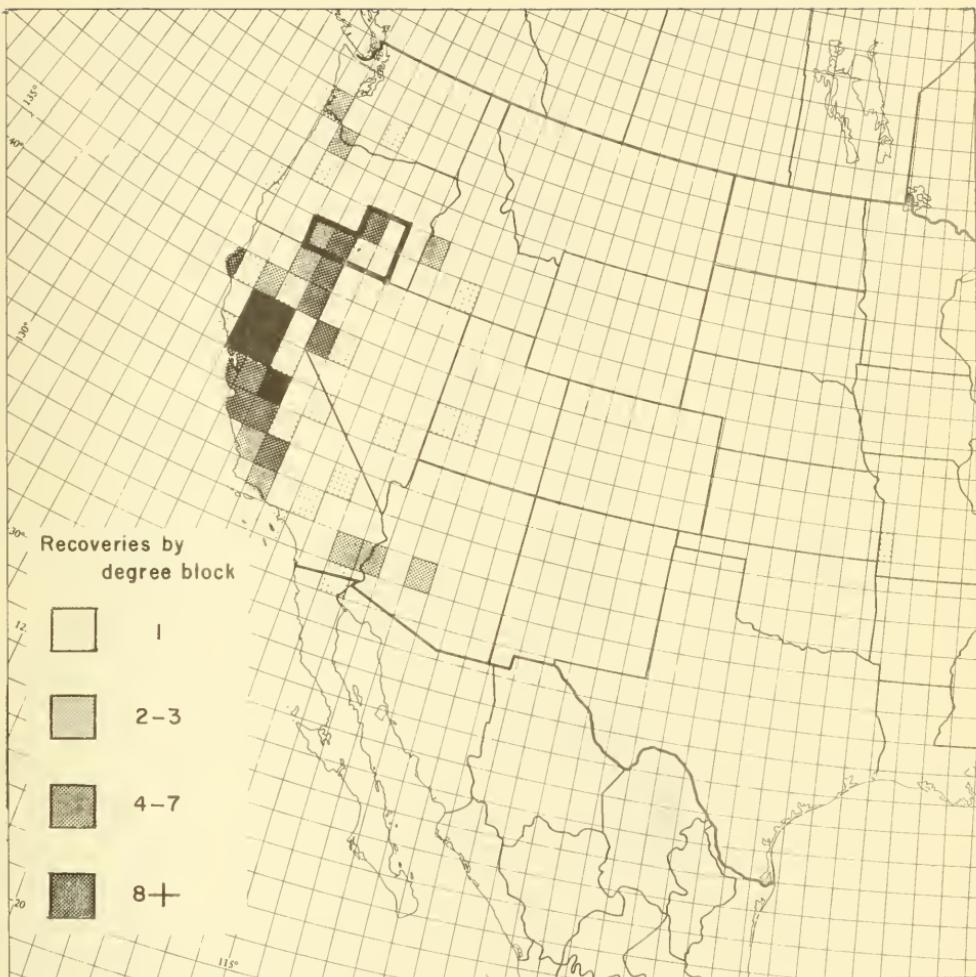


Figure A-46.--Direct recovery distribution of green-winged teal banded during the fall in interior Oregon.

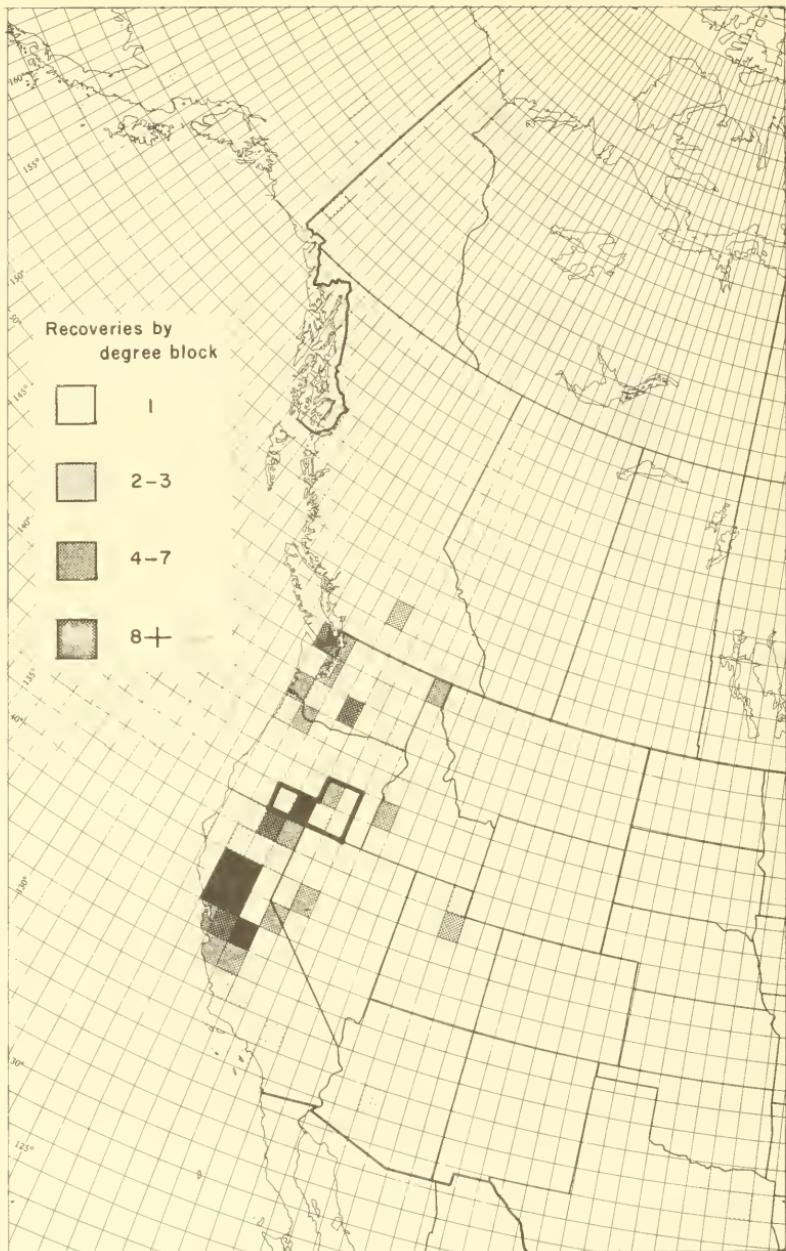


Figure A-47.--Indirect recovery distribution of green-winged teal banded during the fall in interior Oregon.

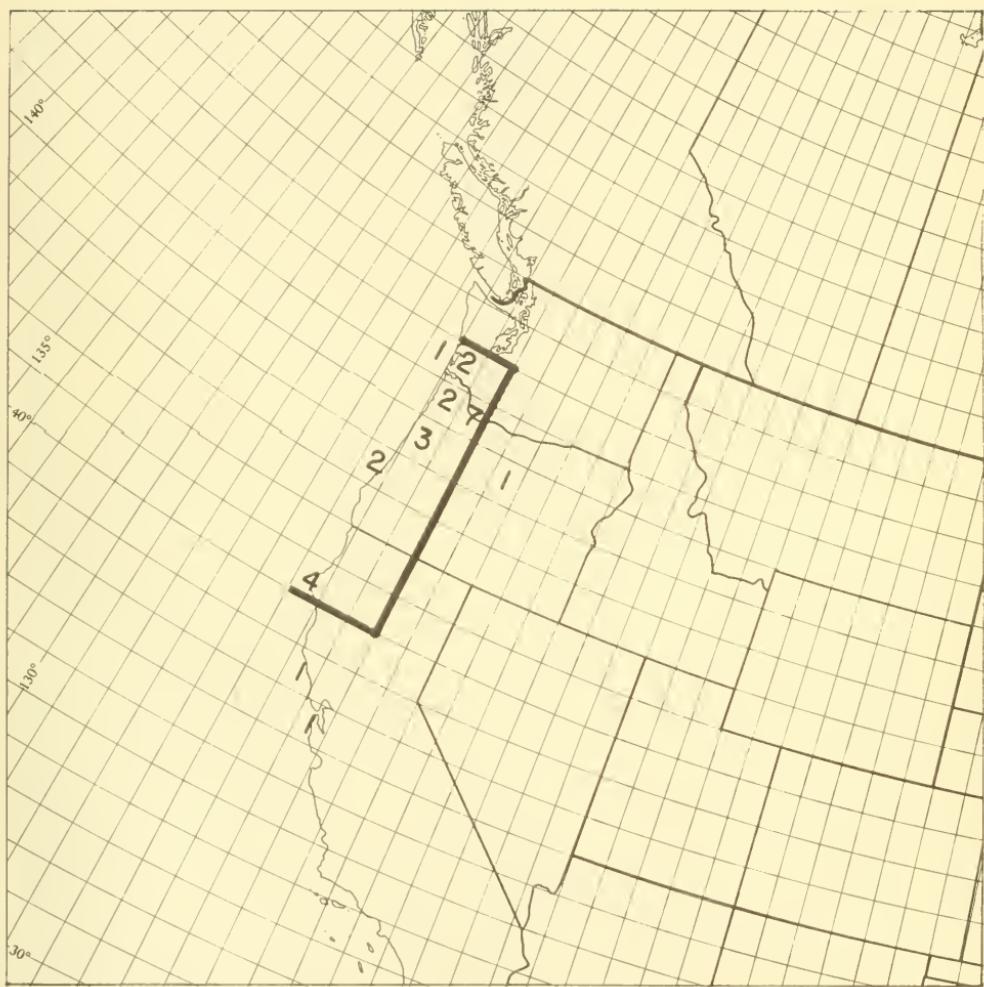


Figure A-48.--Direct recovery distribution of green-winged teal banded during the fall in the coastal area of the Northwestern States.

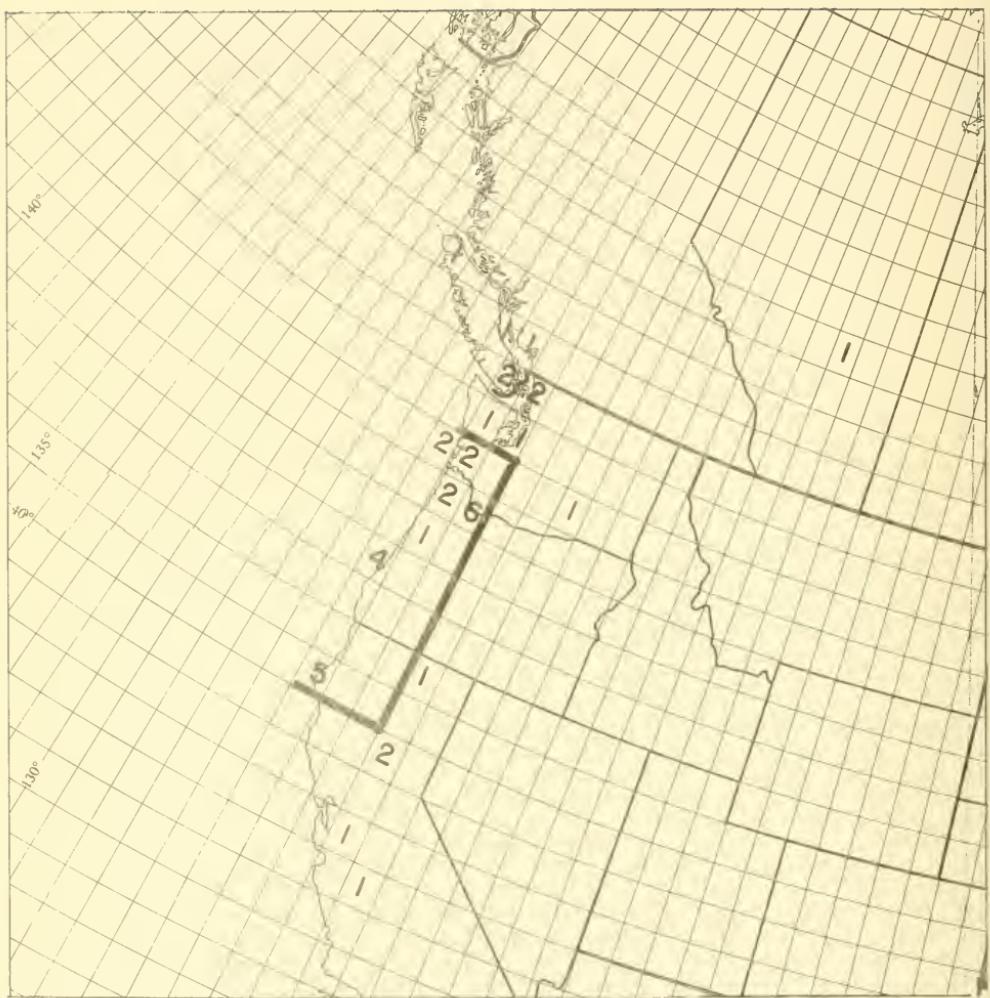


Figure A-49.--Indirect recovery distribution of green-winged teal banded during the fall in the coastal area of the Northwestern States.

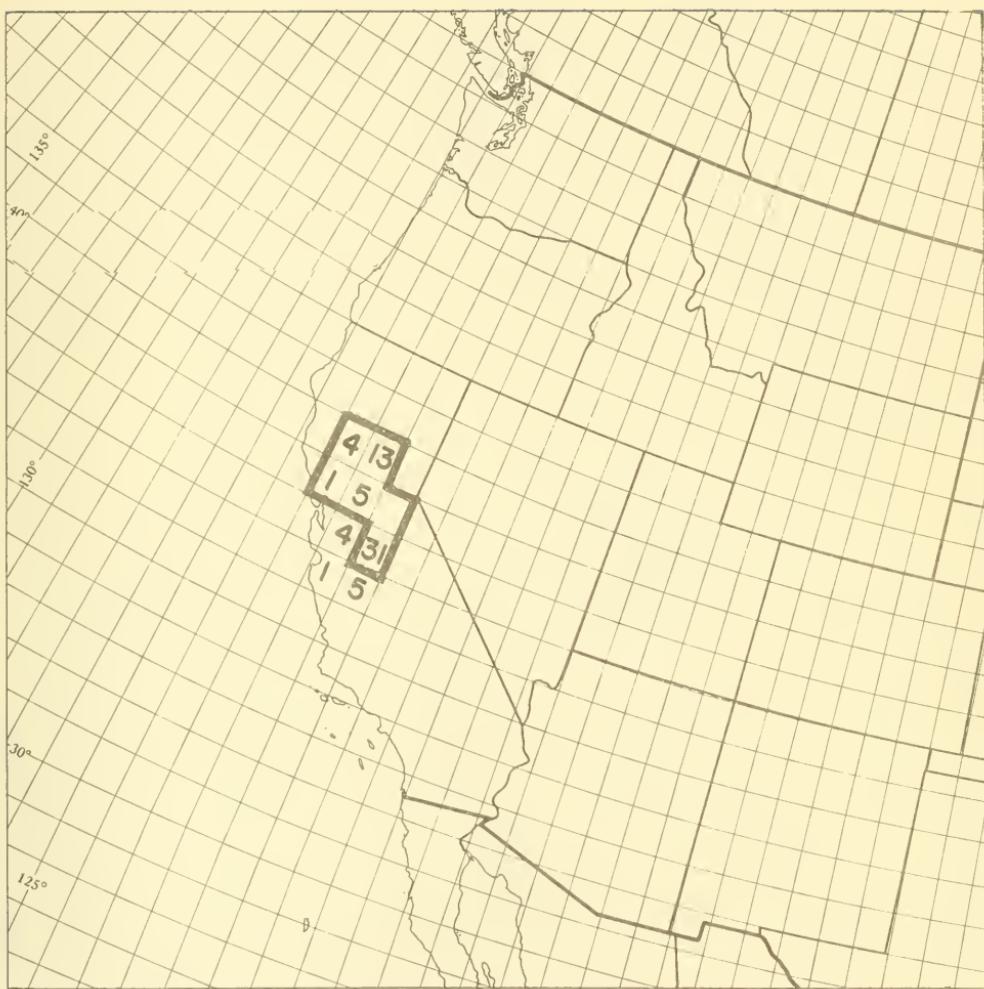


Figure A-50.--Direct recovery distribution of green-winged teal banded during the fall in Central Valley, California.

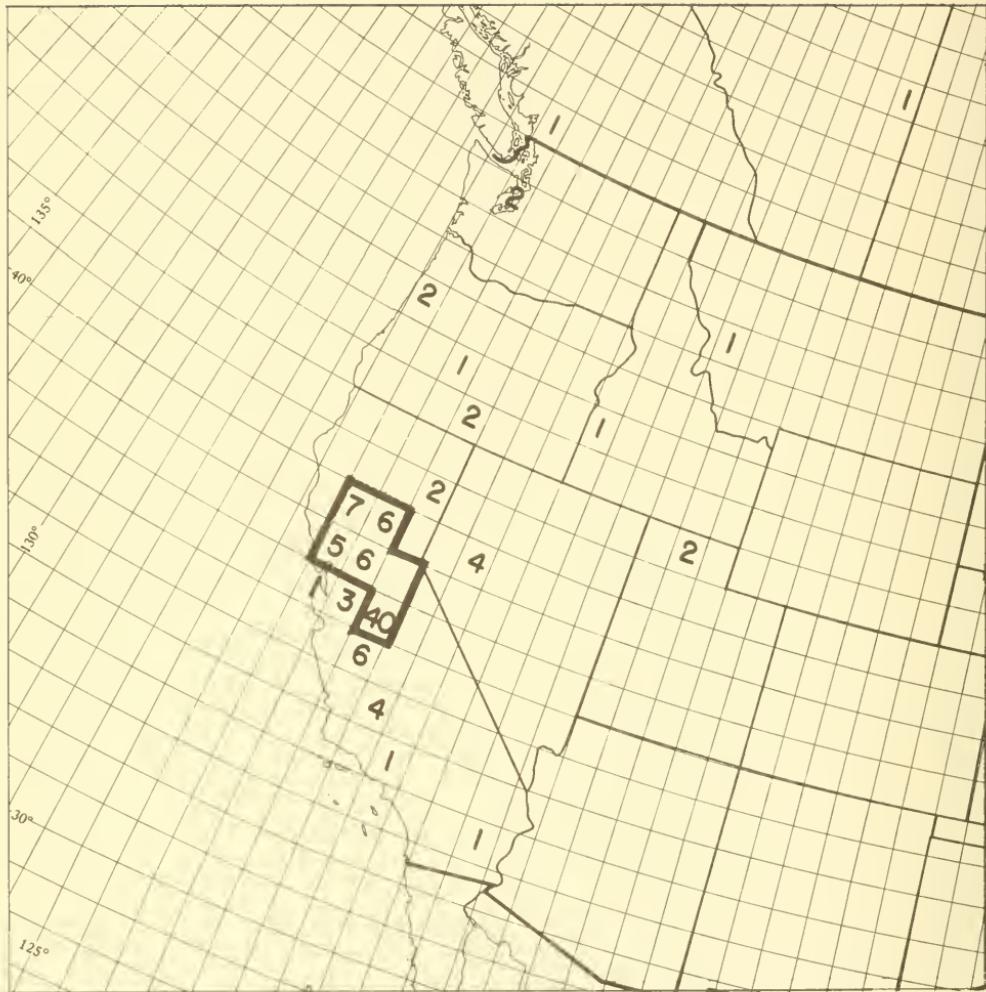


Figure A-51.--Indirect recovery distribution of green-winged teal banded during the fall in Central Valley, California.



Figure A-52.--Direct recovery distribution of green-winged teal banded during the fall at Salton Sea, California.



Figure A-53.--Indirect recovery distribution of green-winged teal banded during the fall at Salton Sea, California



Figure A-54.--Recovery distribution of green-winged teal banded during the fall in southwestern Arizona.

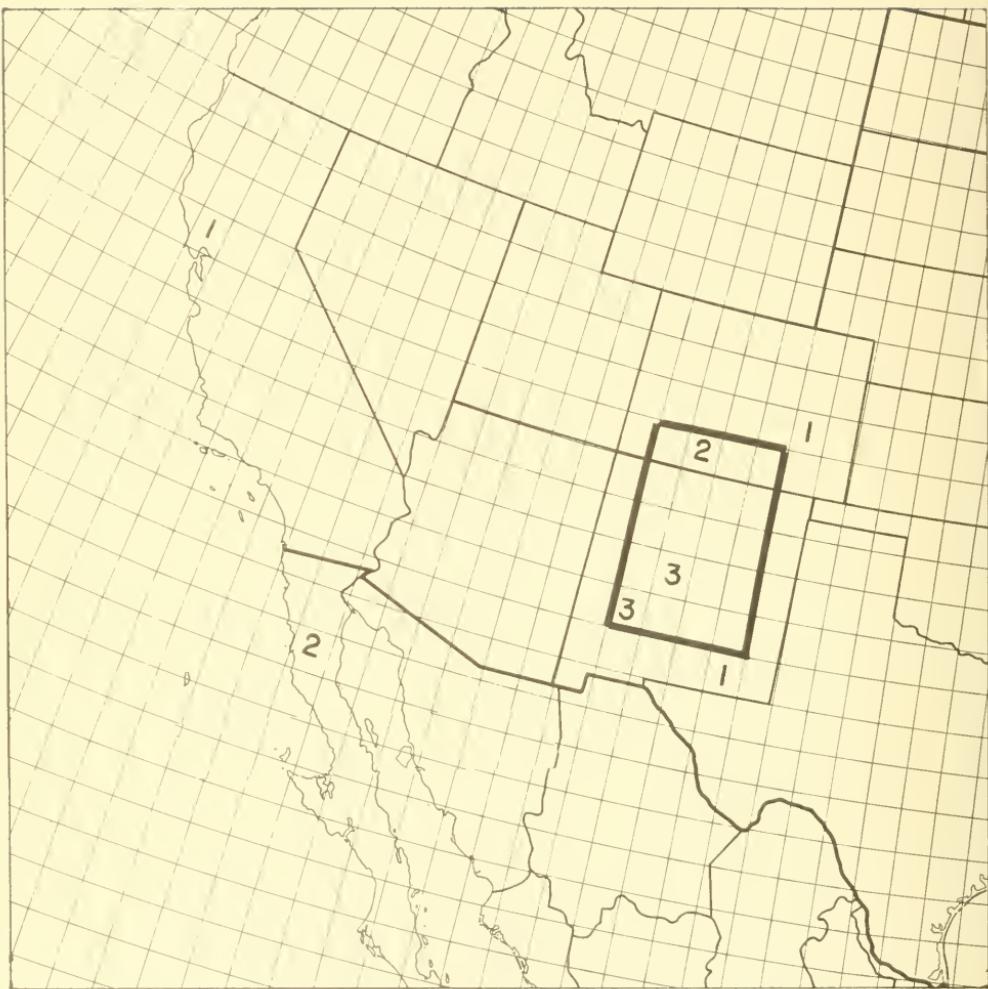


Figure A-55.--Direct recovery distribution of green-winged teal banded during the fall in New Mexico.

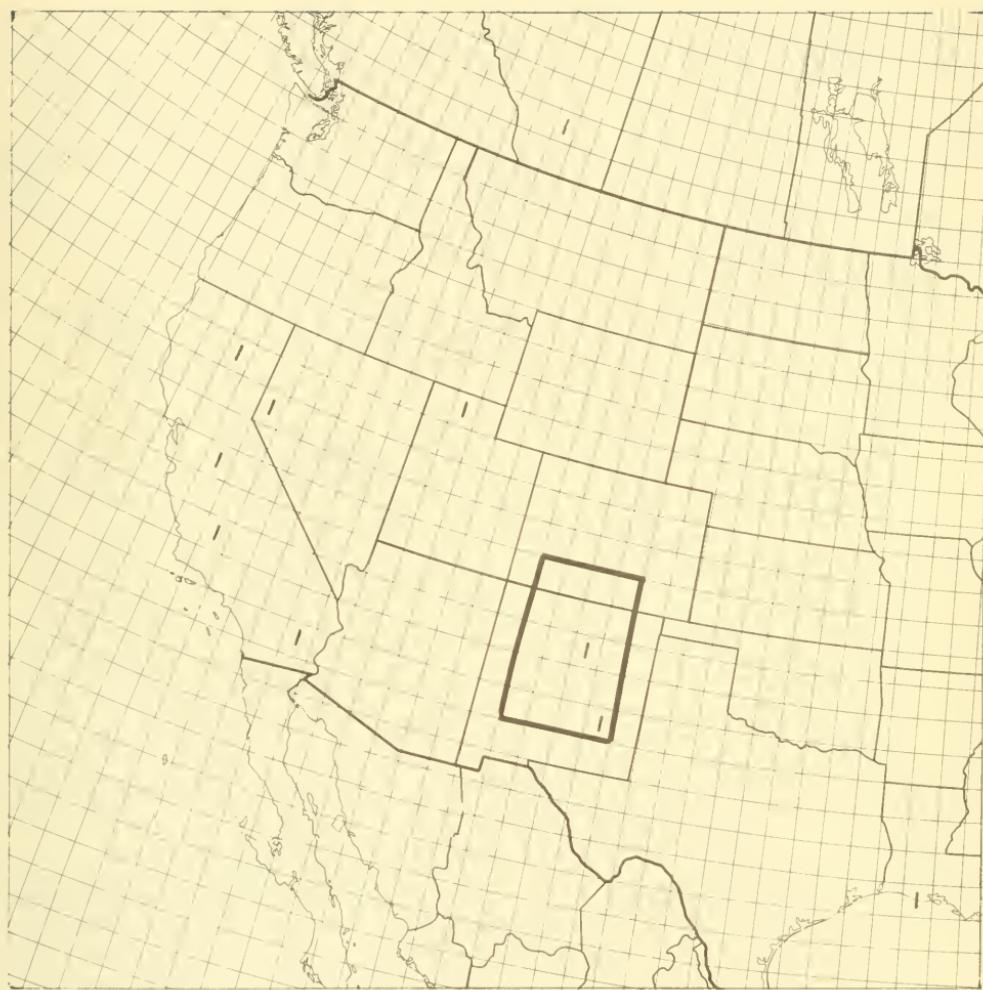


Figure A-56.--Indirect recovery distribution of green-winged teal banded during the fall in New Mexico.

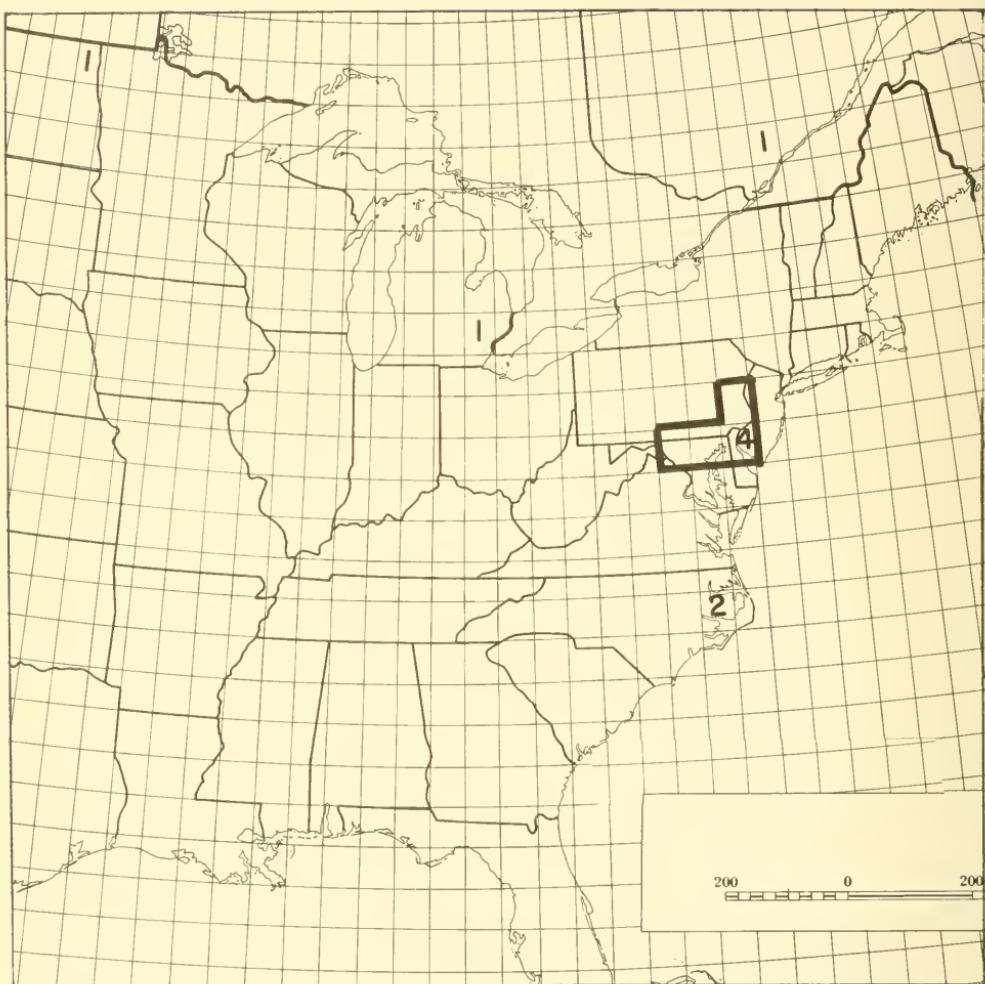


Figure A-57.--Recovery distribution of green-winged teal banded during the winter at Delaware and Chesapeake Bays.

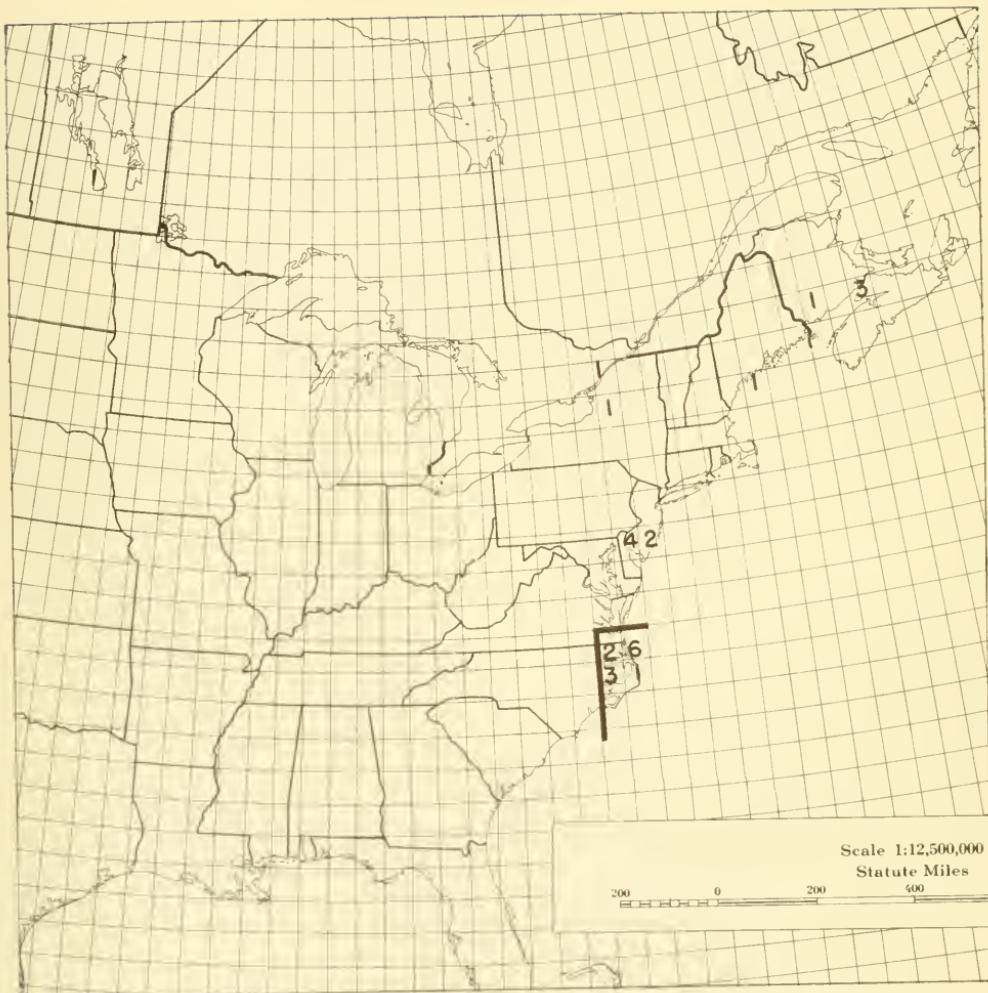


Figure A-58.--Recovery distribution of green-winged teal banded during the winter in the Mid-Atlantic States.

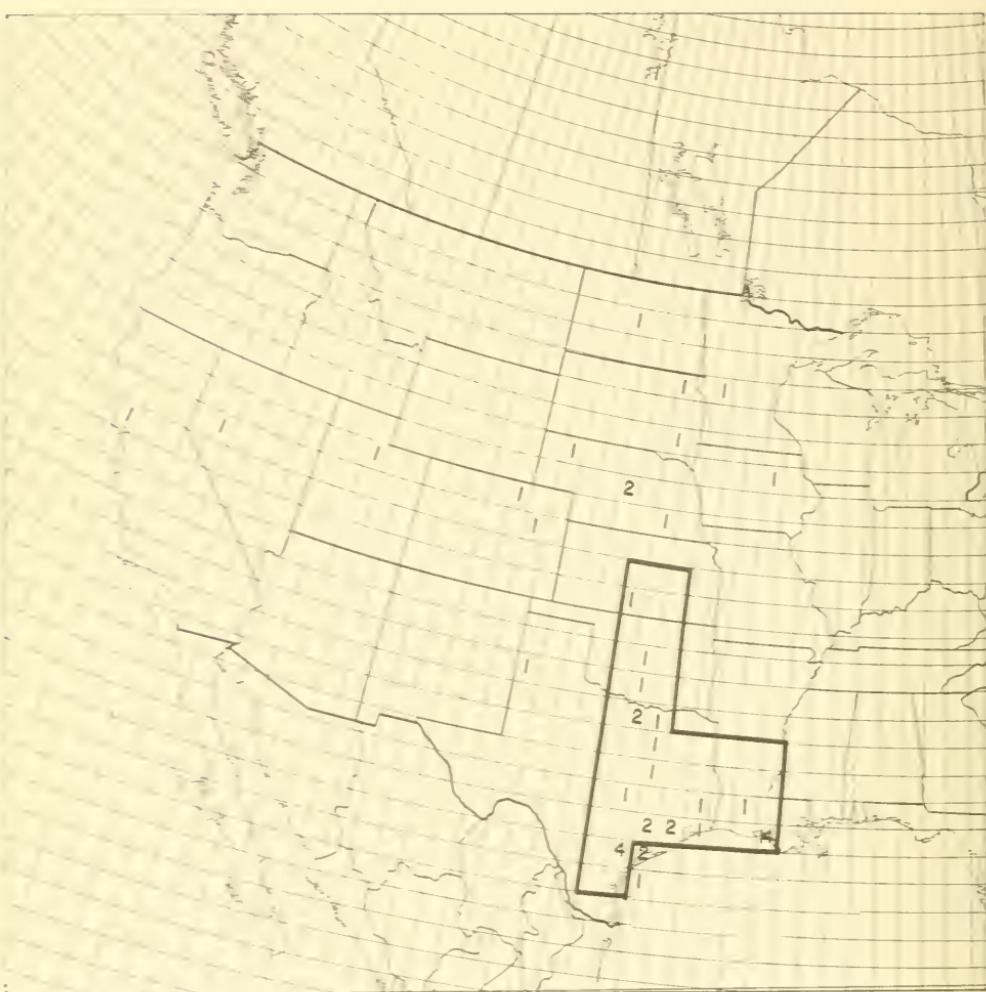


Figure A-59.--Recovery distribution of green-winged teal banded during the winter in the South-Central reference area.

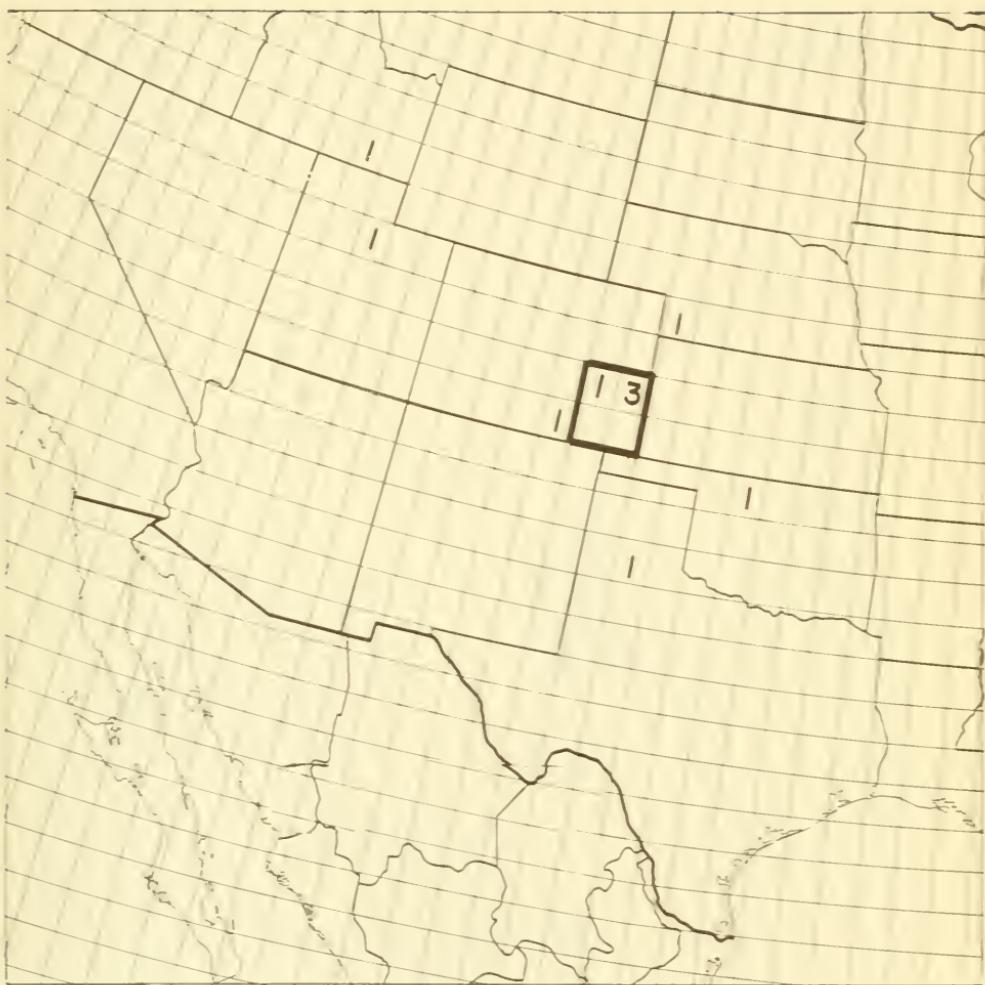


Figure A-60.--Recovery distribution of green-winged teal banded during the winter in Colorado.

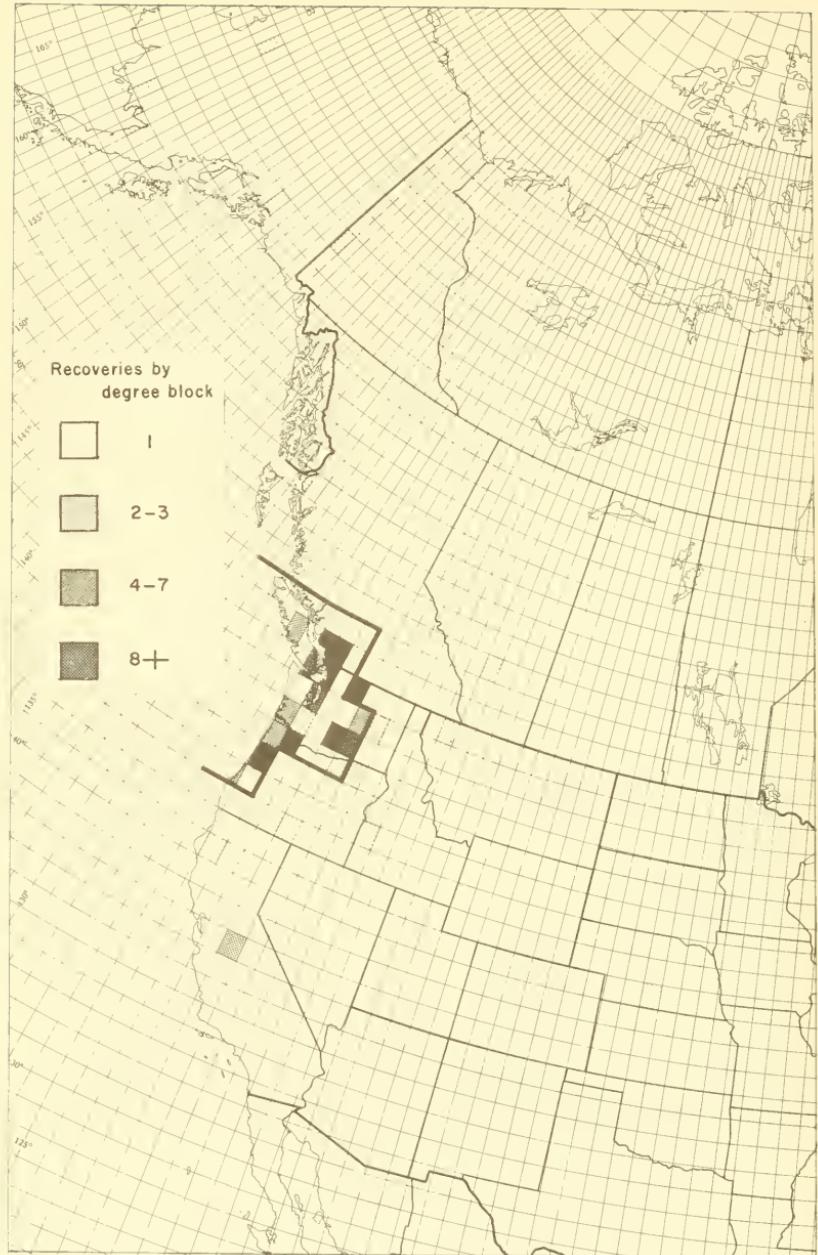


Figure A-61.--Recovery distribution of green-winged teal banded during the winter in the Puget Sound area.

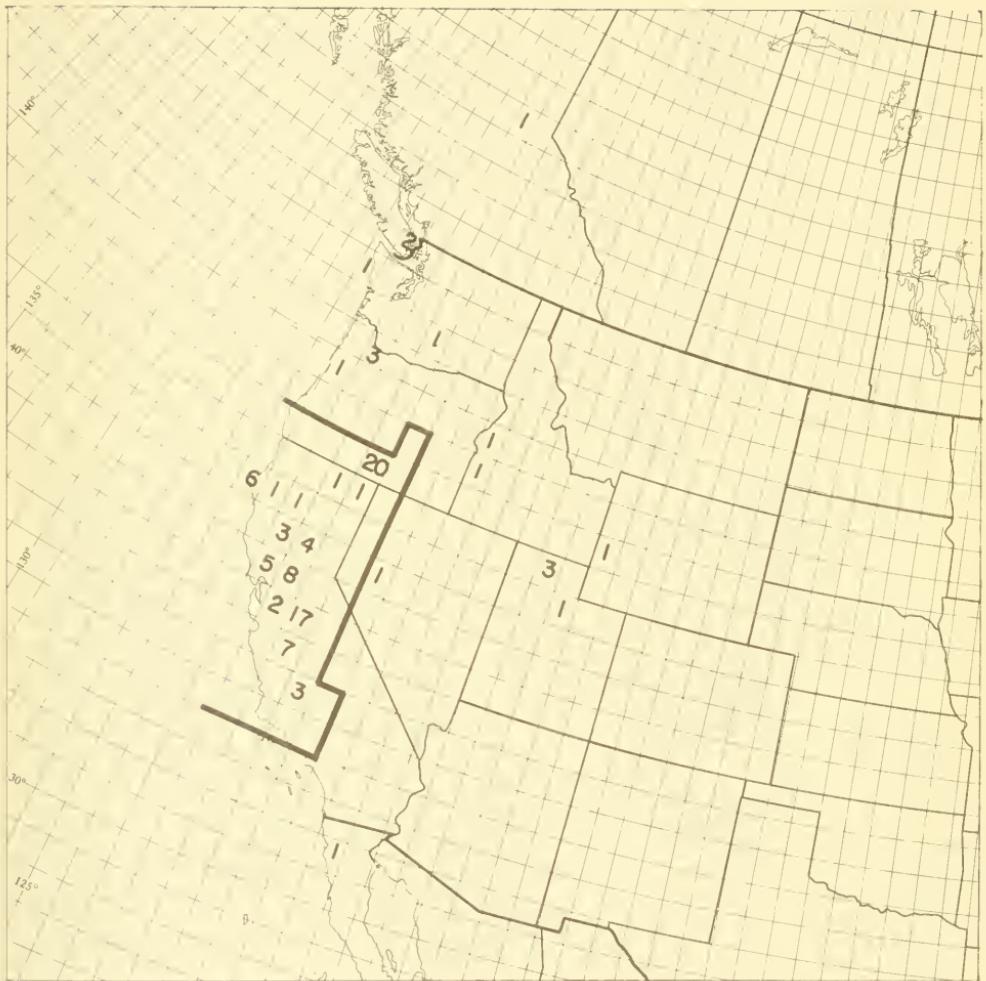


Figure A-62.--Recovery distribution of green-winged teal banded during the winter in Central Valley, California.

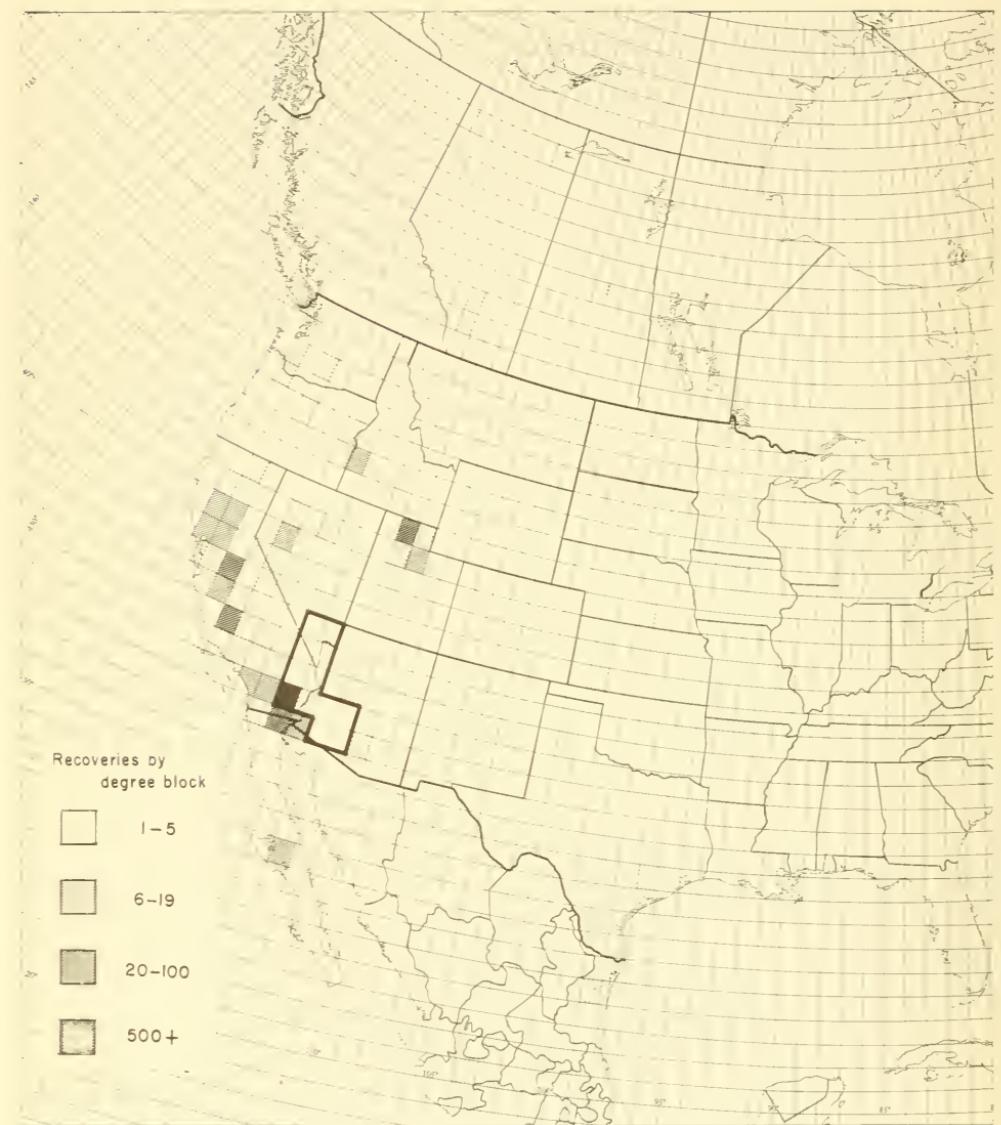


Figure A-63.--Recovery distribution of green-winged teal banded during the winter in the Imperial Valley reference area.

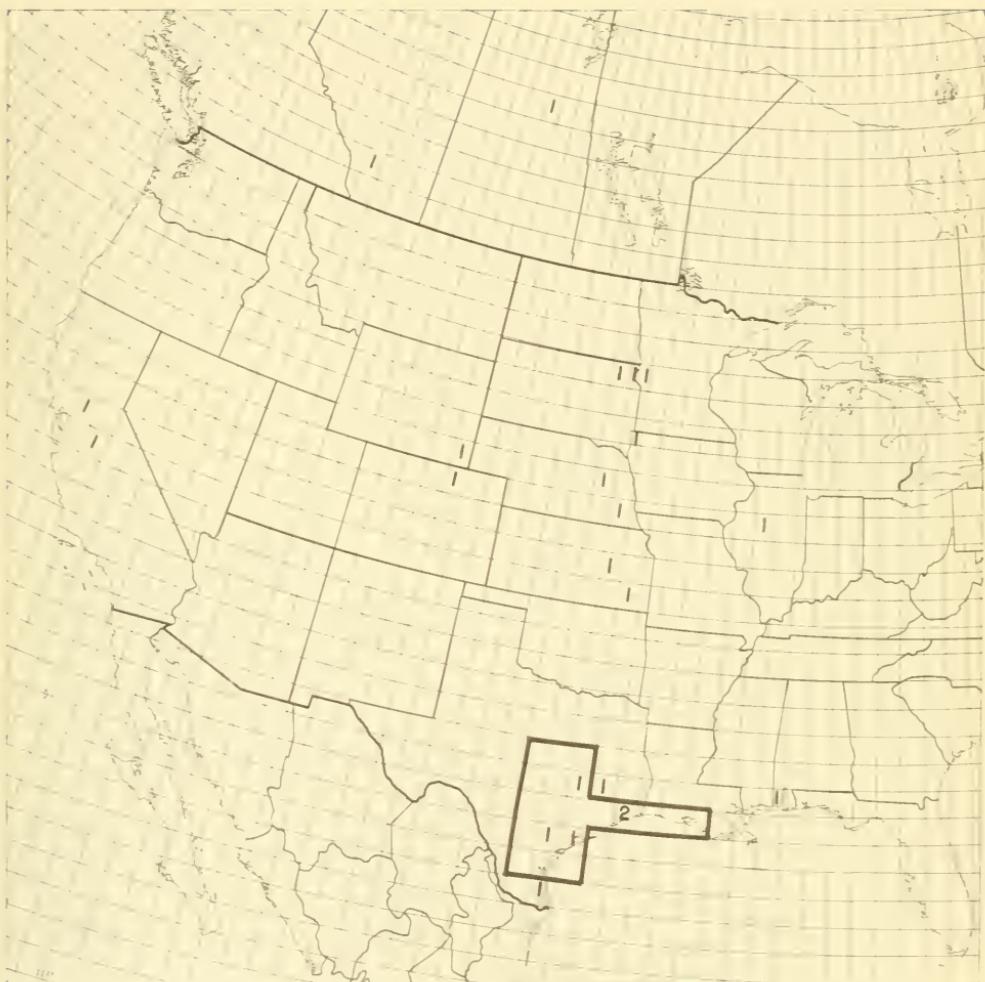


Figure A-64.--Recovery distribution of green-winged teal banded during the spring in Louisiana and southern Texas.



Figure A-65.--Recovery distribution of green-winged teal banded during the spring in Oklahoma and northern Texas.

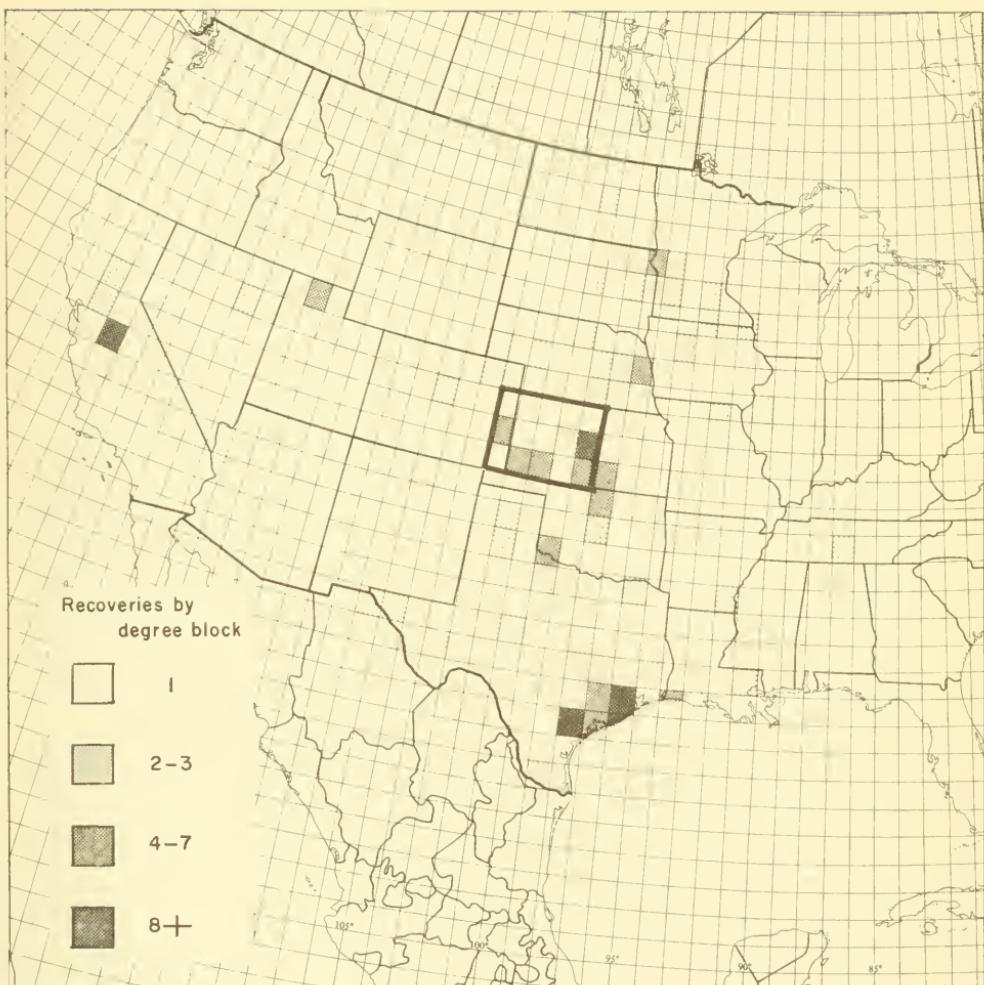


Figure A-66.--Recovery distribution of green-winged teal banded during the spring in Kansas.

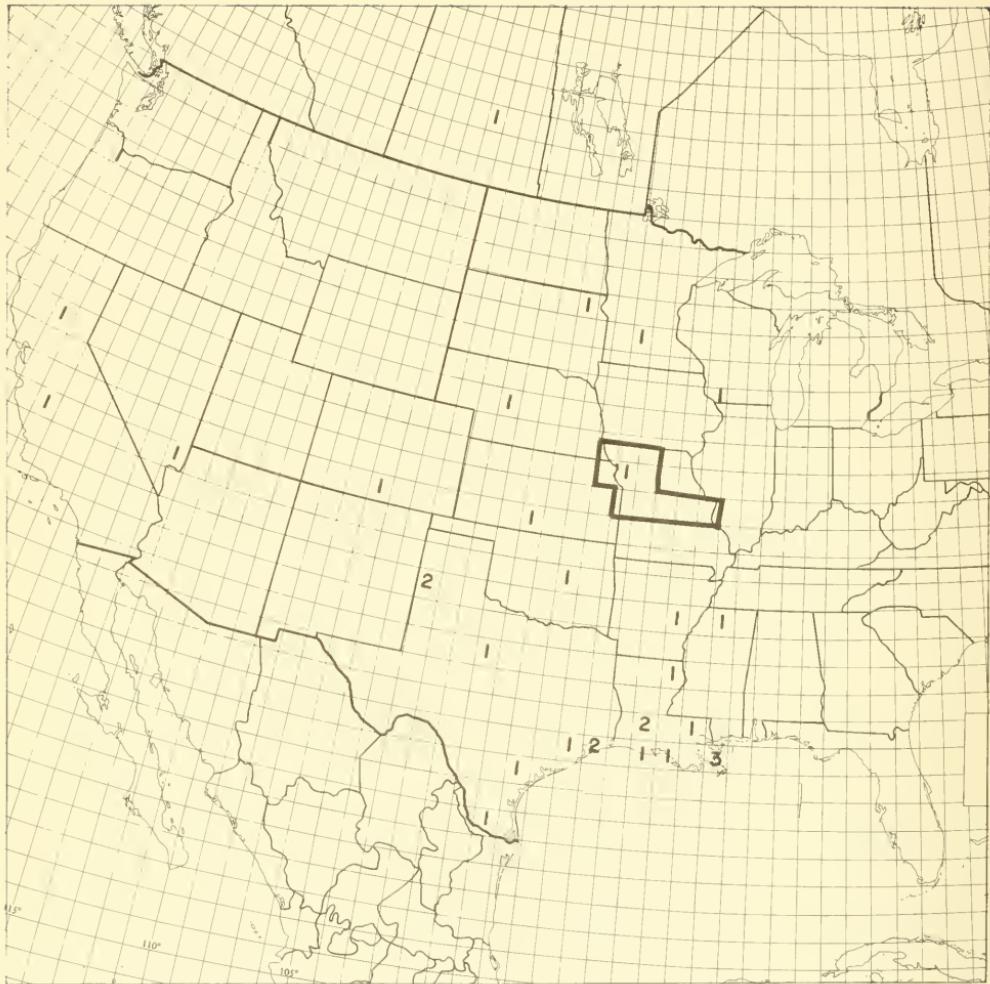


Figure A-67.--Recovery distribution of green-winged teal banded during the spring in Missouri.



Figure A-68.--Recovery distribution of green-winged teal banded during the spring in Nebraska and South Dakota.

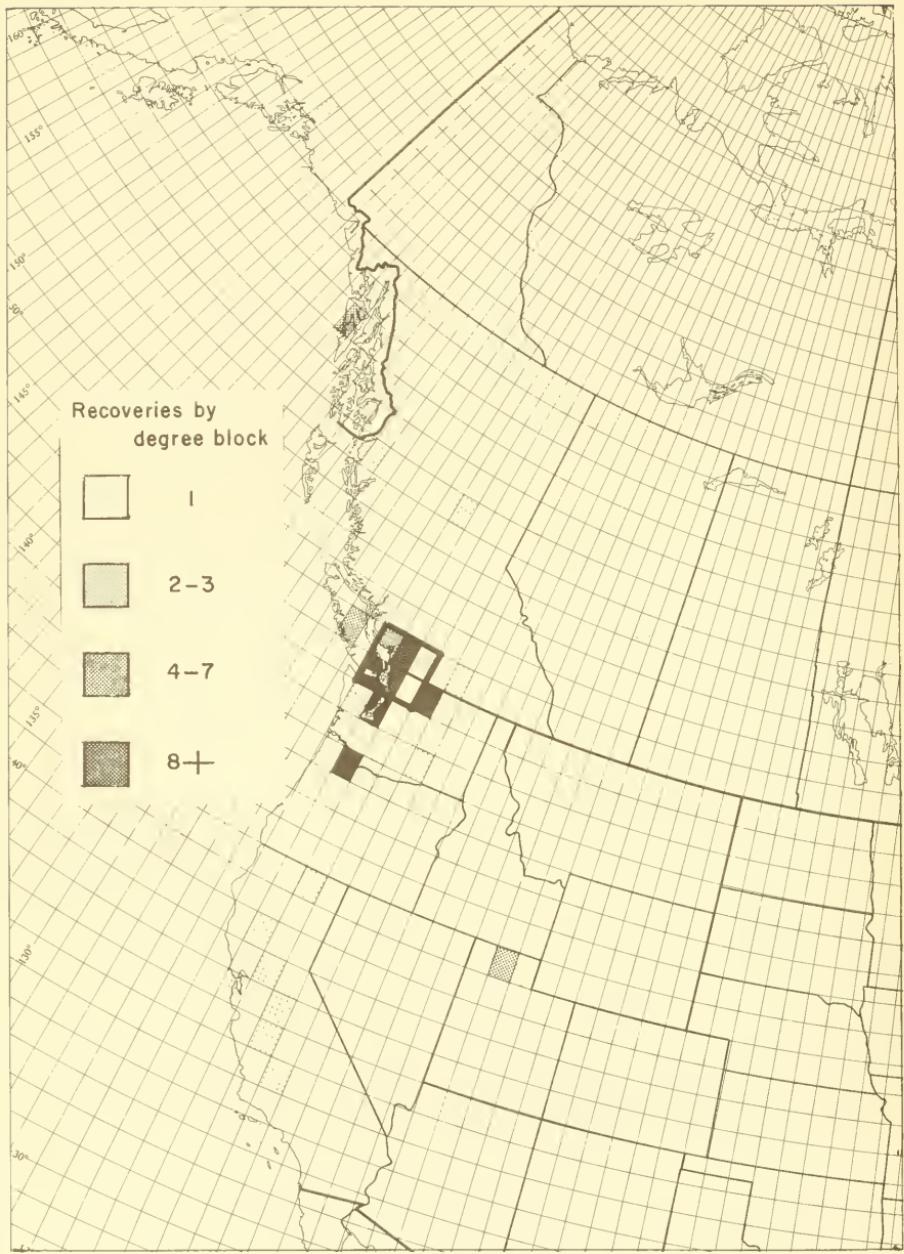


Figure A-69.--Recovery distribution of green-winged teal banded during the spring in the Puget Sound area.

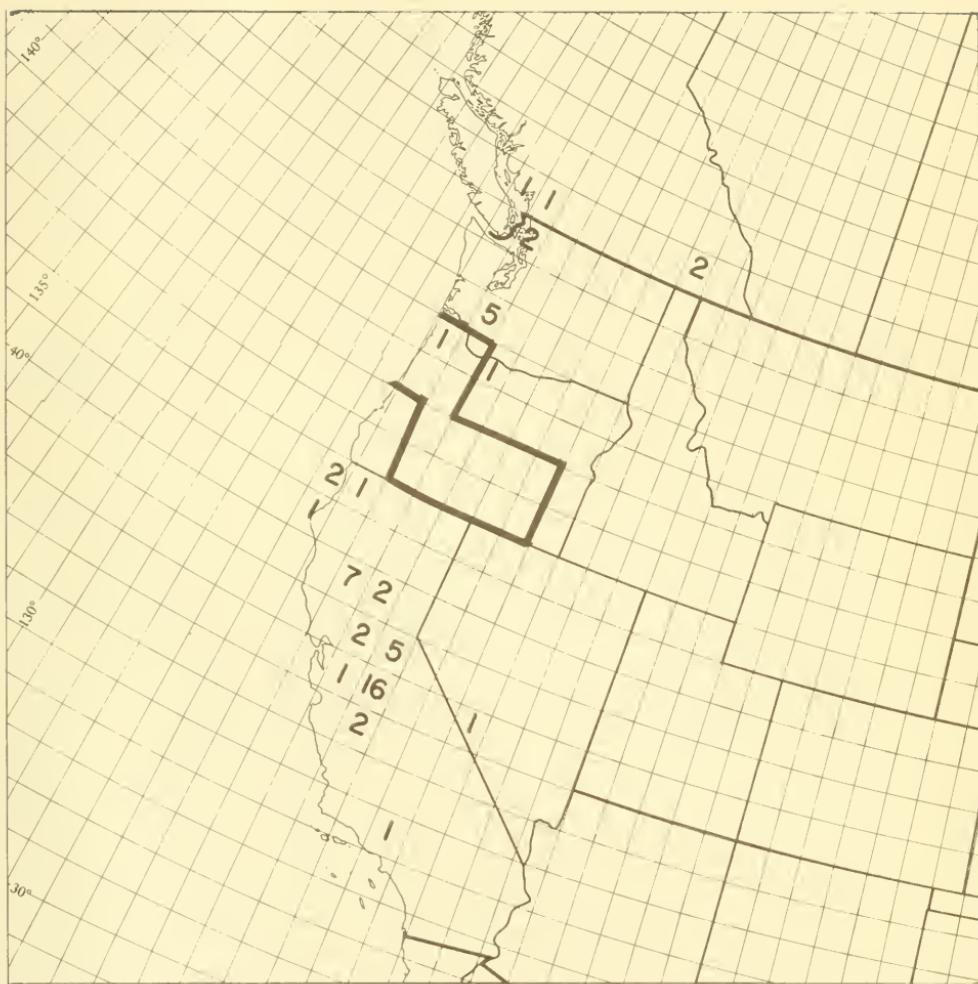


Figure A-70.--Recovery distribution of green-winged teal banded during the spring in Oregon.

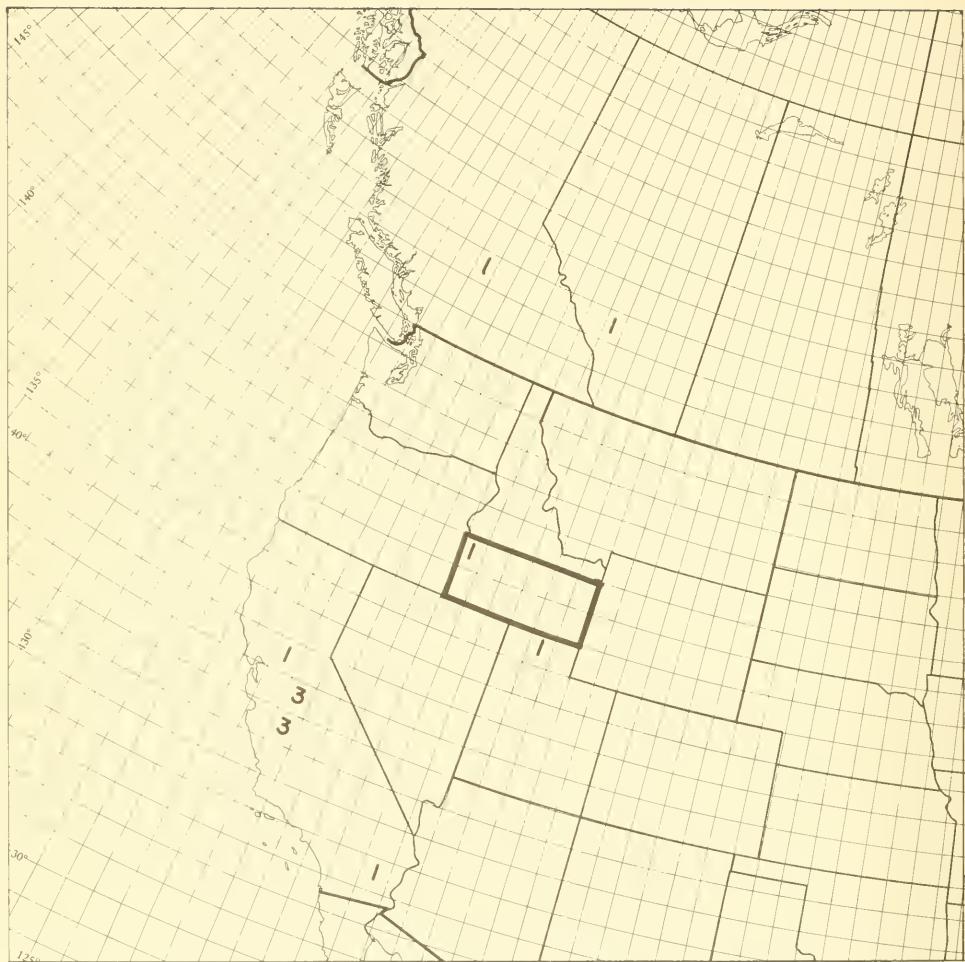


Figure A-71.--Recovery distribution of green-winged teal banded during the spring in southern Idaho.

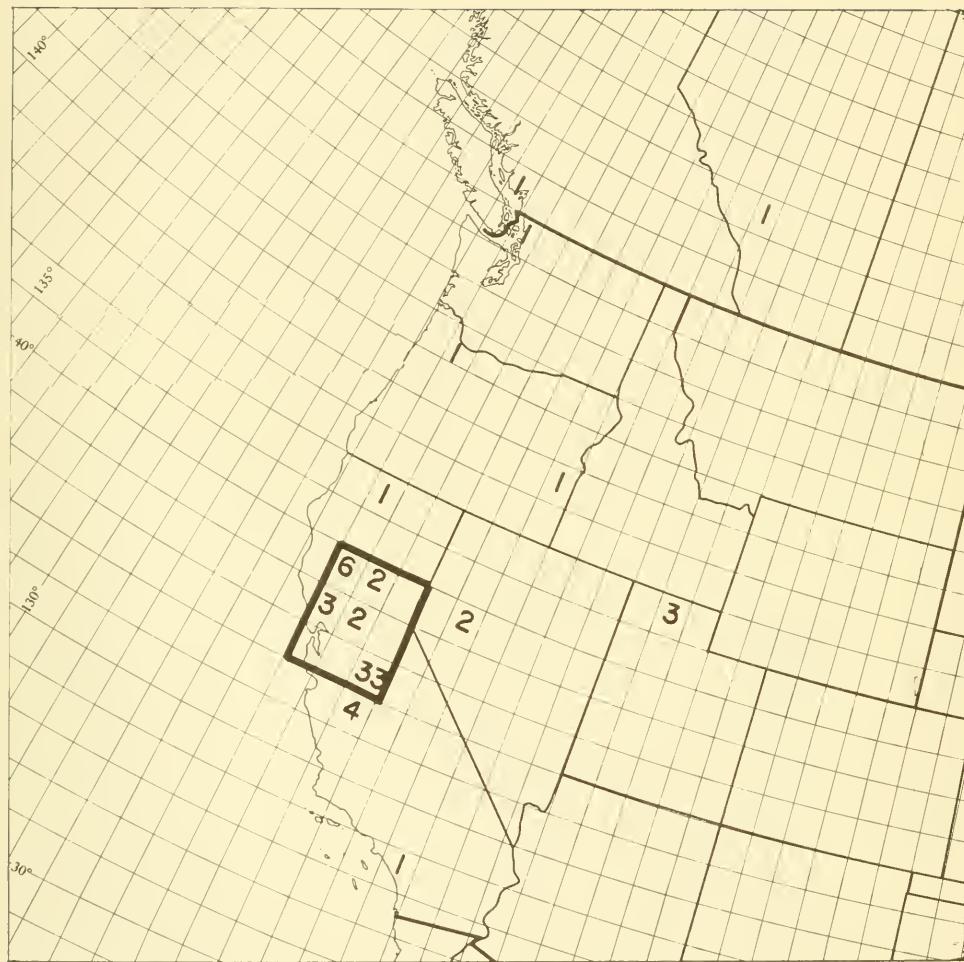


Figure A-72.--Recovery distribution of green-winged teal banded during the spring in Central Valley, California.

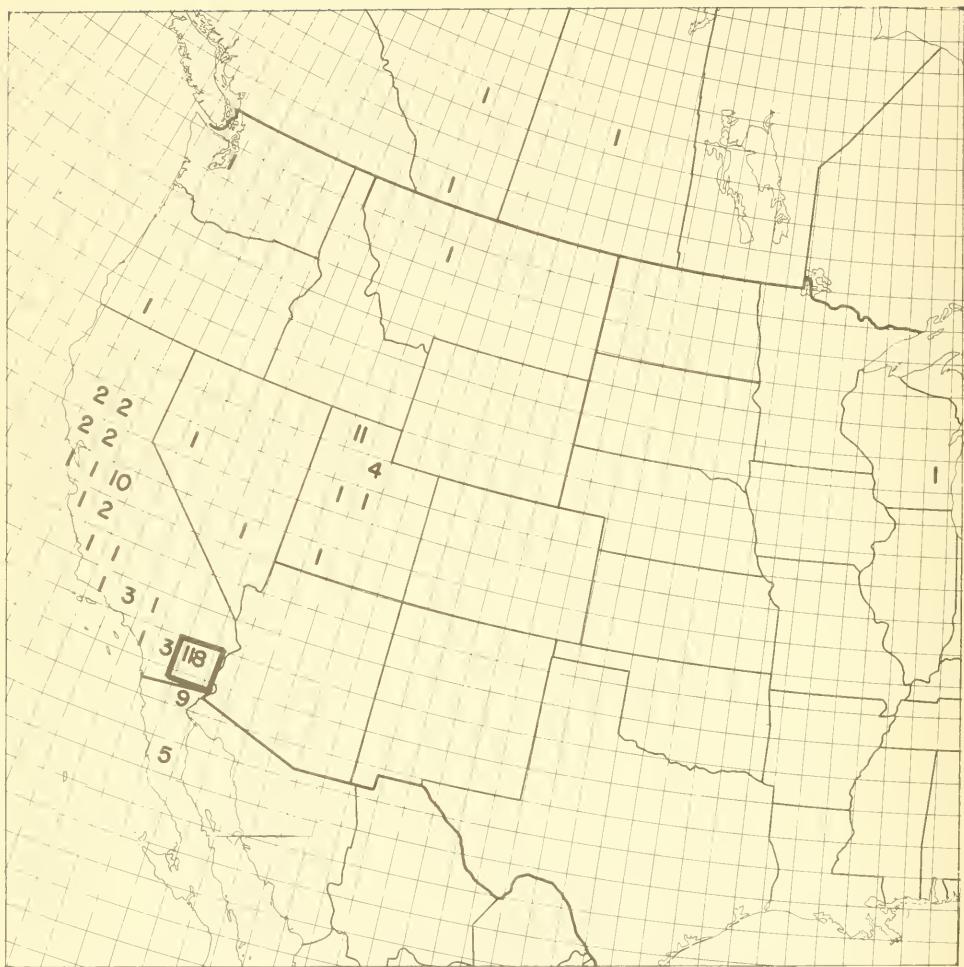


Figure A-73.--Recovery distribution of green-winged teal banded during the spring at Salton Sea, California.



Figure A-74--Recovery distribution of green-winged teal banded during the spring in Nevada.

APPENDIX

B. COMMON AND SCIENTIFIC NAMES OF WATERFOWL MENTIONED IN THIS REPORT

Mallard (Anas platyrhynchos)
Black duck (Anas rubripes)
Green-winged teal (Anas carolinensis)
European green-winged teal (Anas crecca)
Blue-winged teal (Anas discors)
Pintail (Anas acuta)
Wood duck (Aix sponsa)
Redhead (Aythya americana)
Canvasback (Aythya valisineria)
Lesser scaup (Aythya affinis)
Ring-necked duck (Aythya collaris)

The Department of the Interior, created in 1849, is a Department of Conservation, concerned with management, conservation, and development of the Nation's water, wildlife, fish, mineral, forest, and park and recreational resources. It has major responsibilities also for Indian and Territorial affairs.

As America's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States, now and in the future.



CONSERVATION PLEDGE

I give my pledge
as an American to save
and faithfully to defend from
waste the natural resources of
my country—its soil and
minerals, forests,
waters, and
wildlife.